RELIABLE EXPLORATORY JOURNEY:

IMPROVING PUBLIC TRANSPORT TRAVEL EXPERIENCE FOR FOREIGN PASSENGERS THROUGH SERVICE DESIGN PERSPECTIVE

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Reliable Exploratory Journey
Improving Public Transport Travel Experience for Foreign Passengers through Service Design Perspective

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Abstract

With the internationalisation of a city, the importance of improving foreign passengers' public transport experience has gained increasing attention. Public transport experience depends on public transport service quality. Reliability is an essential public transport service quality that contributes to satisfying public transport experience. There have been many studies on improving the reliability of public transport from the perspective of providers, but only a few studies consider what factors affect the sense of reliability from the perspective of passengers and how this feeling is formed in public transport experience.

The user-centric service design approach is applied to investigate foreign passengers' travel behaviours and impacting features in Greater Helsinki public transportation system. User-centric service design method helps to understand the travel behaviours of diverse foreign passengers. For foreigners, public transport services need to be differentiated, because their perception of reliability may differ from that of locals, who are the primary users of regional public transport. Service design methods help to consider different stakeholders in public transport service. Hence, user-centric service design approaches are applied to visualize and evaluate the public transport experience of foreign passengers in the Greater Helsinki region in this study.

The results indicate five categories of public transport features that affect the sense of the reliability of foreigners, which are communication, system operation, environment, emotion and people. The outcome shows that public transport authority can help foreign passengers quickly adapt to unfamiliar public transport services in Greater Helsinki through early communication. The use of public transport systems and the information obtained in the environment can be simplified through the design of HSL application, such as multi-sensory interactions and information integration. Furthermore,

positive emotions can be created through competent crews and a combination of public transport and other travel services. Therefore, this research suggests a design strategy targeting excellent reliable public transport experience which is achieved through the implementation of a combination of various levers.

Keywords:

User experience, Public transport, Service design, User-centric design, Reliability, User experience evaluation

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1. Introduction

This chapter discusses the significance of studying passengers' differentiated demand for public transport experience. Especially focus is on foreign passengers, whose demands are often overlooked. The chapter introduces the public transport in the Greater Helsinki region, which narrows down the scope of the thesis. This thesis studies the public transport experience of foreign passengers by applying user-centric service design in the context of the Great Helsinki region.

1.1 Public Transport

According to Encyclopedia Britannica (2018), public transport is a series of travel technologies that enable people to move around the city. The crucial feature of public transport is that it is possible to move many people in one vehicle, which significantly improves the efficiency of urban transportation (Encyclopedia Britannica, 2018). With the expansion of the city, public transport plays an increasingly important role in many cities. The vigorous development of public transport help solves environmental and social challenges. Satisfaction with public transport depends on public transport service quality. Reliability is the most critical quality of public transport services (Oort, 2011). Although many cities have been committed to improving the public transport experience for locals, in some international cities, the public transport experience of foreigners has been neglected, even if this group of people play an increasingly important role in the economic development of cities (Virkar & Mallya, 2018).

1.1.1 Towards Better Public Transport Experience

Over the past two hundred years, most countries have undergone tremendous changes in urban transport brought about by urbanization. Feng et al. (2017) social and spatial transformations in urban China have by now been well documented. But while it is highly likely that these changes relate to far-reaching alterations in travel behaviour as well, so far this topic has received much less attention. With this paper, we aim to help fill this gap through the following research questions: What are the main changes in travel behaviour in Nanjing, China; and how can we explain these changes? We answer these questions on the basis of a study of repeated cross-sectional data from the Nanjing Residents Travel Survey (NRTS summarised the challenges of urban transportation caused by urbanization and concluded that the vigorous development of public transport is an effective solution. On the one hand, due to the expansion of urban area, it promotes demand for fast transportation. On the other hand, the increase of personal wealth and the improvement of infrastructure provide more opportunities for rapid transit. Rapid transit mainly refers to private cars and public transport. However, over-reliance on private cars may lead to some problems. First of all, increasing the use of private cars and driving distance will help to increase carbon dioxide, noise emissions and energy consumption. Furthermore, excessive dependence on private cars is a potential cause of chronic diseases such as coronary heart disease and stroke among urban residents. Besides, if the public transport is not efficient in the city, there will be inequality inaccessibility: for example, high-income groups with private cars can go farther and arrive more diverse destinations, while low-income groups without cars may travel shorter distances and have a smaller range of activities (Feng et al., 2017) social and spatial transformations in urban China have by now been well documented. But while it is highly likely that these changes relate to far-reaching alterations in travel behaviour as well, so far this topic has received much less attention. With this paper, we aim to help fill this gap through the following research questions: What are the main changes in travel behaviour in Nanjing, China; and how can we explain these changes? We answer these questions on the basis of a study of repeated cross-sectional data from the Nanjing Residents Travel Survey (NRTS. However, the travel distance of residents is closely related to the scope of activities, social resources, employment opportunities, the convenience of life and many other aspects. Therefore, the inequality of travel mode will make residents feel the

inequality of life subjectively, which may lead to social division.

If the increasing number of private cars is not curbed, it will bring higher social and environmental pressure to the city. Therefore, it is necessary to build sustainable transport facilities and services. Guiding sustainable development of transportation in the city is a big challenge. Providing available and efficient public transport facilities and services can promote the material flow of cities may be one of the effective solutions (Feng et al., 2017). Studying and improving urban public transport is in line with the historical background.

The process of urbanization inevitability requires constant changes in public transport. The increasing population in the city means that new demands constantly appear. For example, the urban population is increasing. If the public transport sector is not correctly adjusted, it will lead to very crowded public transport, which will prevent passengers from continuing to use public transport. Therefore, public transport needs to change public transport facilities and services according to the changing market demand. Besides, the transportation and technical equipment provided by industrial development for cities are constantly updated, which is also the reason for the continuous study of public transport.

Because of climate change, urbanization and social equality, the governments hope to attract more people to use public transport services. In the past few decades, citizens have more choice of transport modes, so there are more and more competitors in the public transport sector. It is generally believed that in order to overcome the challenge, a market-oriented public transport service should be designed from users' perspective (Fellesson & Friman, 2008; Molander, Fellesson, Friman & Skålén, 2012). If users have a satisfying public transport experience, they will choose public transport as their travel mode. This trend is not only in the field of transportation research but also in other adjacent disciplines such as social science mobility research, psychological mobility research, mobility culture research and even marketing, which show great interest in the field of transportation experience (Schiefelbusch, 2015). Overall, in the past decades, the interest in public transport experience has been growing both in academia and in practical research.

1.1.2 Public Transport Service Quality: Reliability

Travel behaviours are complex. People always make choices in different modes of transport by comparing characteristics costs and their needs (Beiraõ & Cabral, 2007). In order to attract passengers to switch from private car to public transport, public transport needs to adjust services according to the attributes passengers need (Beiraõ & Cabral, 2007). The quality of service is an essential factor in user satisfaction (Prioni and Hensher, 2001).

Peek, and Hagen (2002) argued that reliability is one of the primary quality aspects considered by travellers. Reliability is the decisive factor in determining user satisfaction in public transport (Conee & Feldman, 1998; Bates, Polak, Jones, & Cook, 2001). If travellers do not have a reliable experience when using public transport, they will be dissatisfied with public transport, which will become an essential reason for passengers to switch to other modes of transport (Oort, 2011). Therefore, it is necessary to create reliable public transport experience to attract urban residents to use public transport. However, reliability is a very abstract and intangible attribute. The concept of reliability will be explained in the next chapter. It is crucial to study how passengers evaluate the reliability of public transport services.

Although the experience of public transport comes from public transport services, passengers' attitudes towards public transport services are not only affected by service level itself but also psychological factors (Fujii & Kitamura, 2003; Beiraõ & Cabral, 2007). Psychological factors refer to perceptions, beliefs, attitudes and habits (Ajzen, 1991; Fujii & Kitamura, 2003; Beiraõ & Cabral, 2007). Therefore, changing psychological factors, such as their perception of reliability, may also contribute to excellent public transport experience; even the service remains unchanged (Fujii & Kitamura, 2003).

1.1.3 Improve Public Transport Experience for Foreigners

It is essential to understand that different user groups evaluate the quality of service in different ways (Beiraõ & Cabral, 2007). Foreigners' public transport experience may differ from that of locals. These two groups of people have different perceptions, habits and purposes. The difference in these psychological factors will lead to deviations in the process of evaluating public transport services, even if they are using the same public transport system. So, the public transport service serve well for the local people may do not act the same to foreigners. Also, for foreigners and locals, their reliable public transport experience may be created by different service elements. For example, for local people, if the bus arrives at the same time as scheduled every day, the local travelers will have a sense of reliability. However, foreigners may not know where to get the information of the timetable, and such information blind area will lead to unreliable experience. In this case, the key service elements of reliable experience are entirely different for foreigners and locals in the same scenario as bus arrival time. Therefore, it is necessary to differentiate some public transport services for foreigners.

As cross-border communication become frequent, foreigners play an essential role in economic development (Albalate & Bel, 2010). It is necessary to create a reliable public transport experience for foreigners, as mobility is the primary issue for the newcomer of the city. (Virkar & Mallya, 2018) Public transport experience plays a vital role in users' satisfaction with the city (Albalate & Bel, 2010).

When it comes to foreigners 'public transport experience, the relationship between public transport experience and tourism should be mentioned. Many scholars emphasize the importance of a transport system tourism development (Abeyratne, 1993, Chew, 1987, Khadaroo and Seetenah, 2007, Khadaroo and Seetenah, 2008, Prideaux, 2000; Albalate & Bel, 2010). Virkar and Mallya (2018) argued that tourists' satisfaction with the destination could be improved by improving the quality of public transport services. Service quality measures how well service performance matches customer expectations (Lai & Chen, 2011). Therefore, without affecting the local public transport experience, the construction of foreign tourists 'expectations of local public transport is the way to overcome

some implementation challenges. People's expectations come from past experience and knowledge, so some information about public transport in destination needs to be conveyed to foreign passengers. Le (2014) indicated that sustainable tourism public transport should be reached by appropriate marketing strategies.

1.2 Public Transport in Greater Helsinki Region

Helsinki is committed to the development of sustainable urban transport systems and therefore invests heavily in public transport. According to (HELSINKI CITY PLAN, 2013), raising public transport service level is Helsinki's long-term goal. By strengthening the connection between various modes of transport and improving the transport efficiency of the transport system, residents' public transport experience has been improved, so that people's travel mode has gradually shifted from private cars to public transport.

Public transport in Helsinki is a network of different modes of transport. Commuter trains and metro form the backbone of the transportation network, supplemented by buses and trams in the city center (HSL, 2017). By improving the reliability and accessibility of public transport, the attraction of travelers to public transport will be increased. In 2017, the annual total number of passengers reached 374.7 million (HSL, 2017). For local residents, public transport is a convenient mode of travel, and they are generally satisfied with public transport services (HSL, 2017).

1.2.1. Population and Trends in Finnish Capital Region

Helsinki has a lot of geographical dividends. First, the flight time from Helsinki to Asia is relatively short. Helsinki is an ideal staging post connecting Europe and Asia. Second, developing maritime and rail transport increase links to other European cities. Third, Helsinki locates in the Gulf of Finland Growth Triangle. These geographical advantages have brought more cross-border exchanges to Helsinki. More foreigners will visit Helsinki. By 2020, Helsinki Airport will receive 20 million passengers annually. Helsinki is becoming a dynamic, internationally competitive world-class hub. Helsinki presented their vision in HELSINKI CITY PLAN (2013) "In 2050, Helsinki is one of the major interchange stations in the Nordic region" with a well-designed public transport system that efficiently connects interchange hubs, such as airports, railway stations, docks, with other locations in the city center. This would maximize the benefits of Helsinki as an interchange city.

Helsinki tourism enjoyed record growth over the last decades. In 2017, the number of foreigners staying overnight in Helsinki increased by 15%, and the records will always be refreshed. In 2018, Finland hosted nearly 7 million overnight foreigners, with 23.9 million foreign tourists staying in Helsinki. Also, the foreign residents live in Helsinki reached 62,000 (Population, 2019). They come to Helsinki to travel, study, work and attend meetings. Obviously, they use public transport in different ways and for different purposes as the local residents. If the same public transport service is provided to the local people, it will inevitably lead to some bad public transport experience. For example, for the locals, a concise public transport road map is too scarce for foreigners. Many foreign tourists say they cannot get any information from the route map. Therefore, it is necessary to develop public transport services also according to the needs of foreigners. Moreover, these foreigners come from all over the world with multiple cultural backgrounds. Their existing public transport experience will affect their perception of Helsinki public transport, which poses a challenge to relevant research.

1.2.2 Helsinki Regional Transport Authority

The public transport service in Helsinki is provided by a joint local authority, Helsinki Regional Transport Authority (Finnish: Helsingin seudun liikenne, HSL), "whose task is to develop and provide smooth, reliable transport solutions to customers' needs in the region" (HSL, 2017). HSL played excellent performance in improving public transport. Local residents are generally satisfied with public transport services, and the passenger number has also increased.

However, when HSL serves foreigners by just translating public transport services for local residents, there will inevitably be inappropriate situations. Helsinki is increasingly internationalized, and more foreigners are entering Helsinki. The number of foreign tourists staying in Helsinki reached 23.09 million, and the foreign residents live in Helsinki reached 62,000. Thompson and Schofield (2007) indicated public transport experience of foreign passengers might affect their satisfaction with the city. In some foreigners' social media, the author observed some unsatisfactory voices. For these foreigners, the quality of public transport experience will influence their behaviours in Finland, such as consumer behaviour and social networking publicity. It is necessary for HSL to meet the public transport needs of such a large group of people and provide them with excellent public transport services.

Furthermore, there are limited channels for foreigners to give feedback about public transport services to local organizations. It is difficult to know whether they are satisfied with Helsinki's public transport or not. Also, the study in-depth about what their public transport needs are is needed. However, with the development of Helsinki towards the vision of 2050, it is necessary to carry out relevant research to enhance foreigners' public transport experience in the Greater Helsinki region.

1.3 Scope of the Thesis

The Greater Helsinki region is growing into an international hub. As the number of foreigners coming to Finland is growing, it is necessary to develop the public transport user experience for this group of people since the public transport service was initially designed for local residents, whose needs are quite different from foreigners. Public transport experience faces the public. This study investigates how to improve the public transport experience for foreigners, but this should not bring bad influence to local residents. Hence service design mindset and toolset were applied in this research. Furthermore, the user experience of foreign passengers is based on public transport services. Overall, this study discusses the topic of public transport user experience from a service design perspective.

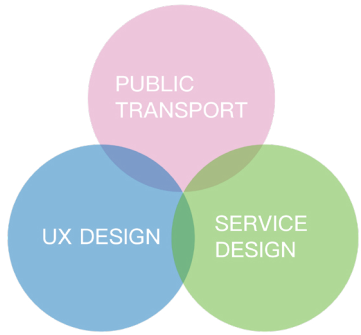

Fig.1 Scope of the Thesis

1.3.1 Research Objectives

The purpose of this study is to identify how non-locals perceive reliability during the public transport journey in Greater Helsinki region. I hope that this research will attract attention to non-locals' public transport experience in Helsinki, as the Greater Helsinki is planning to be an international hub in the future and the number of foreigners coming to the Greater Helsinki region is increasing. It is necessary to prepare for future growth. Ideally, the outcome of this research is to demonstrate how to utilise user-centric design approaches to evaluate and improve the public transport experience for non-locals.

The personal objective of this study is to develop the professional knowledge of transportation system design, UX design and strategic design. This research offers me an opportunity to conduct cross-cultural research in the area of public transport in the capital region of Finland. Hence, I observed how to develop public transport service in an international city and the future development direction in this industry.

I chose the Greater Helsinki region as a case because I studied and lived in this area for one year. As I learned more about Helsinki, I found that the public transport operation was very reliable. But when some foreigners just arrived in Helsinki, it was not easy to use public transport including me. This affected their exploration of Helsinki. Hence, I want to understand why public transport service is not user-friendly to newcomers and improve this phenomenon because not all foreigners will stay in Helsinki for a long time until they change their first impression. The outcome from the Helsinki case may be applied to other cities to help them become inclusive

1.3.2 Research Questions

In an international city, foreign passengers are one of the primary users of public transport services. However, a few pieces of research have been done on their user experience when using public transport. Reliability is one of the primary service qualities considered by travelers (Peek and Hagen,2002). By improving the reliability and also the perception of reliability of the public transport service the public transport experience of foreign passengers can

be improved. Only then will newcomers be willing to explore the new city by means of public transport. This research was conducted to understand how foreign passengers perceive the sense of reliability when using public transport in a new city and to explore how travel experience could be improved with service design methods.

Research question and sub-questions:

Identification of the research gap formed the main research question that the study aims to find answers:

- **How to improve the sense of reliability for foreign passengers when they are using public transport in the Greater Helsinki region?**

The main research question is supplemented with sub-research questions, which help to understand the phenomenon in a more detailed manner.

- **What influence the perception of reliability when non-locals are using public transport in an unfamiliar city?**
- **What can be improved in the current public transport service in the Greater Helsinki region to meet the foreigner's expectations?**
- **How can service design approaches help in improving public transport experience for non-locals?**

1.3.3 Thesis Structure

The first chapter of this thesis discusses the significance of improving public transport experience for foreigner passengers. Chapter two defines the concepts of user experience and reliability of the study. This chapter also reviews the service design methods used in previous public transport experience studies and introduce how these service design methods would be utilised in this research. The third chapter introduces the multi-methodological research process in this thesis. The fourth part identifies categories that influence the perception of reliability of foreign passengers and discusses the emerging trends of their experience in Greater Helsinki Region. The fifth chapter suggests the design strategy that may help to improve the user experience of foreign passengers in the Greater Helsinki

Region. The last chapter draws a conclusion and discusses the benefits as well as the limitation of this study. Further research directions are also demonstrated with self-reflection in this chapter.

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2. Literature Review

This chapter firstly reviews how user experience is defined in the current researches and discusses how public transport experience can be evaluated and designed. Second, the chapter reviews how design scholars have utilized user-centric service design methods to study public transport experience. Then it summarizes how user-centric service method is utilized to investigate the public transport experience of foreign passengers in this study. Finally, it reviews the concepts of reliability in previous public transport researches and elaborates how the concept of reliability is approached in this study.

2.1 User Experience

In this section, I will firstly review how User Experience (UX) was defined by researchers and designers. According to the characteristics of public transport services, I concluded that public transport experience can be improved from he perspective of properties and time respectively. The differences between local and foreign passengers‘ public transport experience are also reviewed in this section.

2.1.1 What Is User Experience?

For designers, designing for experience is a broad task. In order to narrow down the scope of this study, it is necessary to distinguish between user experience design and experience design. Roto, Law, Vermeeren, & Hoonhout (2011) concluded in UX White paper that “User experience explicitly refers to the experiences derived from encountering system”, which differs from general experience. According to Roto et al. (2011) “Experience in general covers everything personally encountered, undergone, or lived through” UX is a subset of experience. Thus, the scope of the ‘user experience design’(UX) is narrower than the ‘experience design’. Overall, the ‘experience’ in public transport experience in this thesis refers to the user experience.

There are abundant definitions for user experience (UX). Standard experts (ISO 9241-110:2010 clause 2.15) defines user experience as “a person’s perceptions and responses that result from the use and/or anticipated use of a product, system or service”. Nielsen-Norman Group argued that UX is “all aspects of the end-users interaction with company, its service and its products”. They concluded that an exemplary user experience entails two requirements, the first is meet the exact needs of users and the other is the products (physical products service or system) are a joy to own and use. (Nielsen-Norman Group, 2019) Many researchers have argued that UX includes both the pragmatic and hedonic qualities of product use (Hassenzahl, 2003; Mahlke, 2005; Kaasinen et al., 2015). Therefore, user experience involves some subjective feelings of the users, and each user’s user experience could be different. Thus, the experience cannot be designed, but designers can design for experience (Sanders and Dandavate,1999; Kaasinen et al., 2015; Joutsela & Roto, 2016).

2.1.2 Design for Public Transport Experience

Public Transport UX over Properties

In order to improve the public transport experience, designers need to cater for the whole travel with all its stages. The importance of a whole journey approach was set out in the case of London (Tfl analysis, 2017). With this approach, the public transport of Londoners has been improved. As a result, since 2000, the use of public transport in London has increased by 65% (Tfl analysis, 2017). The whole journey refers to the interaction with the overall public transport services. Therefore, to study passengers ‘public transport experience, I need to study their behaviour and subjective feelings when using public transport services, which means public service can be designed for public transport experience. Clatworthy (2011) defines service design as “design for experiences that happen over time and across different touchpoints.” Clatworthy (2010) identified touchpoints are central aspects of service design. Hence, understanding the complete public transport service with all its touchpoints is the basis of the study of public transport experience.

Similarly, Roto et al. (2011) identified that "the factors influencing user experience could be classified into three main categories: the context around the user and system, the user's state and system properties." In order to narrow down the thesis scope, this study will only discuss the factor of system properties in the public transport system. To evaluate how these properties affect the user experience, researchers need to find the products or services that host these properties in the system. The concept of touchpoints in service design can be taken advantage of. The concept of touchpoints is defined as contact points between service providers and customers (Clatworthy, 2010). Each time passengers interact with a touchpoint, they have a service-encounter, which gives an experience to the passenger (Clatworthy 2010). All experiences from touchpoint interactions form the overall public transport experience.

Public Transport UX over Time

Some researchers have utilised the concept of touchpoints to evaluate the public transport experience (Culén, Velden & Herstad, 2014; Prandi, Nisi & Nunes, 2017). However, the scope of public transport experience needs to be differentiated for foreign passengers. As the whole public transport journey of newcomers is different from the locals. For instance, the locals plan their journey before they leave, but some foreign tourists plan their journey before they come to Finland.

The similar concept of time spans is mentioned in UX researches (Roto et al., 2011; Vermeeren et al., 2010). Roto et al.(2011) concluded that according to the usage of time spans, UX could be divided into momentary UX, episode UX and cumulative UX. Hassenzahl (2008) defined momentary UX as "primarily evaluative feeling (good-bad) while interacting with a product or service" A variety of different feelings constitute the behaviour of the user (Hassenzahl 2008). Roto et al. concluded (2011) that episode UX refers to a coherent use of a product or service experience consisting of a series of momentary UX while the cumulative experience is formed through a combination of a series of episodes UX and periods of non-use.

Episode public transport experience refers to accumulated momentary public transport experience in a complete public transport journey. These momentary public transport experiences are formed through the interaction between passengers and public transport services touchpoints. For foreign

passengers, episode public transport is crucial, as the user experience during the journey affects their satisfaction with the public transport service (Le, 2014). This determines whether foreign passengers would choose public transport as their travel mode when exploring the new city. In this study, in order to understand how foreign passengers interact with public transport, it is necessary to know through which touchpoints they have contact with public transport services.

Cumulative public transport UX should be evaluated for improving the public transport experience for foreign passengers. The cumulative public transport experience determines whether foreign passengers will positively promote local public transport services to other foreign tourists. Momentary public transport UX should not only be evaluated interacting moment with the public transport service but also before and after the interaction (Vermeeren et al., 2010). Even though most foreign passengers only use public transport services during the period when they stay in Helsinki, and it is crucial to understand how they plan their journey before coming to Helsinki and evaluate their public transport experience after they go back. Therefore, this study will evaluate the long-term cumulative public transport experience.

Foreign tourists and local residents

As mentioned above, public transport serves both visitors and local residents. It is impossible for the urban Transport Authority to design a separate service for foreign tourists. Therefore, while improving foreign tourists' public transport experience, local residents' public transport experience should not be ignored, which requires a comprehensive perspective on public transport system during research. Thus, service design as a mindset can be adopted in this study.

To sum up this section, public transport experience should be evaluated as a whole journey with multiple touchpoints. Moreover, both episode and cumulative public transport experience should be evaluated for foreign passengers. These provide theoretical backgrounds for the research content of pre-study and the choice of research approaches, which will discuss in the latter part of this thesis (Section 3.2 & 3.3). Public transport service can be designed for public transport experience improvement. Hence, service design method can be utilized in this study.

2.2 Service Design

So far, there are many definitions of service design. The definition of service design depends on how people view it (Stickdorn, 2018). The digital revolution in recent decades has made user experience design and service design inseparable. The digital revolution has led to stronger demand for good experience in service organizations (Stickdorn, 2018). According to Vargo and Lusch (2004), user experience is not designed; instead, it is created through the interaction between users and service elements. Therefore, service can be designed for the user experience (Teixerira et al., 2012). In this study, a reliable public transport experience is assumed to be achieved by designing a set of public transport services. A series of service design approached will be used to understand the requirements of foreign passengers and how public transport services can achieve the expected user experience.

2.2.1 User-Centric Service Design Method

Teixeira et al. (2012) concluded that user experience has become increasingly important for service organizations, and this development has increased ever since. The organizations see user experience as a source of sustainable competitive advantages. Experience cannot be designed (Sanders and Dandavate, 1999). Instead, designers can facilitate a specific type of experience by designing the interaction between users and service elements. (Vargo and Lusch 2004). Teixeira et al. (2012) argued that “services can be designed for customer experience.” On the contrary, many studies have revealed that the ultimate goal of service improvement is to improve user experience (Stickdorn, 2018). In practice, especially in recent years, with the rise of digital services, service design and user experience design overlap and interweave (Stickdorn, 2018). The commonalities provide a theoretical basis for viewing service design as a toolset to improve reliable public transport experience in this study.

The most crucial similarity is that both user experience design and service design emphasize the framework of user-centric design (Stickdorn, 2018; Roto et al., 2011). Both of them observe problems, develop and implement

solutions from users' perspective. In this study, one challenge is that it is difficult for native public transport service providers to build empathy with foreign passengers. In order to improve the public transport experience of foreign passengers, local public transport service providers should understand non-locals' travel motivation, needs and behaviours. However, due to cultural differences, it is difficult for locals to build empathy newcomers without contacting them. The characteristic of service design is to closely work with users in the design process (Culén, Velden & Herstad, 2014). Culén, Velden & Herstad (2014) conducted research to describe public transport journeys and sets of related experience by utilizing service design and user experience design approaches. They designed the travel experience card set by using the concept of the customer journey and touchpoints in service design. This card set engages users in discussion around "good" public transport service and experiences and provides a common understanding of experience during the research; The service design tool is useful to evoke memories of diverse experience. Hence, the rich information helps researchers to know users in depth.

To summarize this section, service design method could provide research participants with a shared understanding of public transport experience and enable productive communication on the same topic. As a result, local service providers could learn about foreign passengers who are from diverse cultural backgrounds in depth.

2.2.2 Service Design Method for Public Transport Experience Improvement

In addition to the reasons of user-centric framework mentioned in the previous section, the comprehensive features also account for the application of service design methods in public transport experience design in this study.

The public transport journey starts from planning the journey to arrive at the destination, during which passengers need to interact with service providers through different channels. For example, passengers plan the journey through mobile phone and buy the tickets through card readers. To answer the research question of what can be improved in public transport service, the service moments (Miettinen & Koivisto, 2009) needs to be identified in

this study. As mentioned above (in section 2.1), in order to improve public transport experience, service providers should cater to the whole public transport journey with multiple touchpoints. As the fundamental part of service design, touchpoints could describe different interaction points. Presenting these touchpoints during the research help evoke passengers' memories of diverse interacting experience (Momentary UX (Roto et al., 2011)). Furthermore, Culén, Velden & Herstad (2014) argued in their studies that service design tools make the users discuss the public transport experience on the basis of a common understanding.

Service design can provide a holistic perspective to view user experience. User experience is a holistic concept that covers all aspects of the context (Zomerdijk and Voss, 2009). It was mentioned in section 2.1.2 that, public transport experience should be evaluated and design as episode public transport experience and cumulative public transport experience. However, the steps involved in these two different scopes of public transport UX are different, and it is hard for participants to understand them in the same manner. Therefore, in this study, two different scales of customer journeys are used to cover all stages in the public transport experience. The essential service design tools, customer journey map, could analysis both episode and cumulative public transport experience. A customer journey map is a flexible tool. Stickdorn (2018) indicated that "Journey maps can have various scales and scopes." The higher-level could be utilized to evaluate the cumulative public transport experience while very detailed step description of micro-interactions could be utilized to visualize the episode one. Customer journey maps visualize the whole present service work from and reveal pain points and opportunities (Stickdorn, 2018).

In summary, service design is a user-centric method that covers multiple touchpoints in the whole journey over different time periods. Service design, therefore, addresses public transport experience comprehensively for foreign passengers.

2.3 Reliability

Since this study focuses on providing reliable public transport experience for foreign passengers, this section reviews the concept of reliability discussed in previous research. In the end, this section defines what a reliable public transport experience is.

2.3.1 Why Is Reliability Important for Public Transport?

As the urbanization grows, the city requires public transport to take more responsibility for urban mobility. This means public transport sectors should compete with private vehicle companies and attract passengers to use public transport. Hence, globally, many urban public transport departments are improving urban public transport services from the perspective of passengers, so as to improve the competitiveness of public transport services (Molander et al., 2012). For example, by improving the public transport experience of passengers, since 2000, the use of public transport in London has increased by 65% (Tfi analysis, 2017). The report pointed out that improving the reliability of public transport is one of the most effective traffic reduction strategies.

Reliability is a prerequisite for passengers to choose public transport mode. Peek and Hagen (2002) adapted Maslow's (1943) hierarchy of needs and introduced the "pyramid of Maslow for public transport" (see Fig. 2). The pyramid has many layers that represent the quality that travelers value in the public transport experience. Several elements below the horizontal "satisfaction pyramid" are indispensable for public transportation services. Without these elements, passengers will be unsatisfied with their public transport experience and probably turn to other transport modes. Among them, reliability and safety are two of the primary quality aspects considered by travelers. This thesis focuses on reliability.

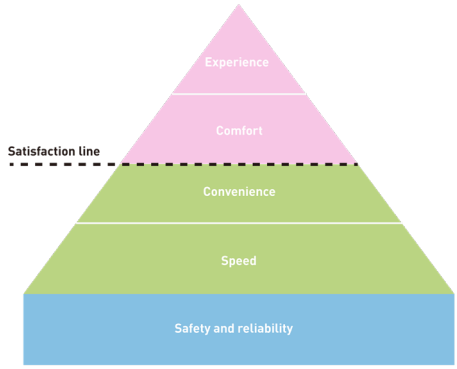

Fig.2 Pyramid of Maslow for public transport (Peek & Hagen, 2002; Maslow, 1943)

Many studies have argued that reliability is the most crucial quality of public transport service (Prashkar, 1977; Jackson and Jucker 1981; Black and Towriss 1991; Eboli & Mazzulla, 2007 and Oort, 2011). All these authors concluded the reliability of transport systems determine the choice behaviour of passengers. An analysis by Oort (2011) indicates that the reliability of a public transport system refers not only to saving travel time from the service provider's point of view but also to the service reliability from the passenger's point of view. Thus, passengers' perceptions of reliability need to be understood.

2.3.2 **Definition of Reliability in This Research**

Through the perspective of cybernetics (Heylighen and Joslyn, 2011; Oort, 2011), the process converts the input into an output. The performance of the process has to match the requirements. The existence of the disturbances will deviate the ideal output. It is the variability of output. If this variability is unpredictable, it will result in unreliability. In other words, if the disturbances are reduced, or the results produced by the disturbances become predictable, reliability can be generated.

Applying the above theory to the public transportation system, the author defines reliability in this study. The process is the series of public transportation services, including planning a journey, buying tickets, and so on. By paying a certain fee, public transport services can bring passengers from one place to a destination within a certain period of time. Among them, the expenses incurred, the time and effort spent, and the experience of passengers are the output public transport service. Through the analysis, the reliability in the public transportation system generated in this way (See Fig.3)

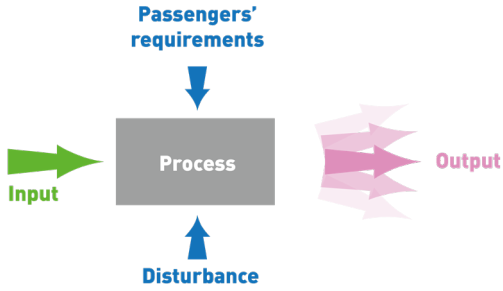

Fig.3 Concept of reliability (Heylighen and Joslyn, 2001; Oort, 2011)

Through information provided by the public transportation system, the passengers can understand what the ideal outcome is, and estimate what disturbances will happen in the public transportation system. Then they form an expectation of public transport services. If the expectations are fulfilled in a positive way, they will think that public transport is a reliable service. On the contrary, they will suffer from unreliability. The source of information in the public transportation system can come from the user's past experience, navigation applications, information board, and so on (See Fig. 4-6). The passengers will be suffered if the unreliability exists in the public transport system. Thus, determining the disturbances in public transport is rather significant.

Fig.4 Input: Navigation board

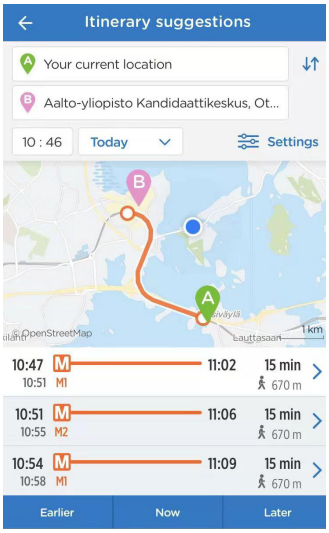

Fig.5 Input: Navigation Application

Fig.6 Input: Information board


2
17:44
Myyrmäki
Helsinki
Helsingfors
A
B
C
D
D
Tietotie
Datavägen
2
1

INTRODUCTION
LITERATURE REVIEW
RESEARCH FOR DESIGN
RESULTS
DESIGN CONCEPT
DISCUSSION &
CONCLUSION

3

3. Research for design

This chapter represents the process of collecting and analyzing data through various methods. Multiple methods enable verification of collected data. People's understanding of the quality of service varies from different cultural groups (Furrer, Liu, & Sudharshan, 2000). In particular, it is necessary to understand the views of foreigners on public transport services during research. Author, as a non-Finnish, do not have a comprehensive understanding of Finnish traffic. Therefore, it is necessary to understand the public transport in the Greater Helsinki region in an authentic context. Besides, the author would evaluate public transport experience from both time and properties inside public transport system perspectives (Roto et al., 2011). The final research outcome would be evaluated through two scopes of the user journey map (Stickdorn, 2018).

3.1 Methodology

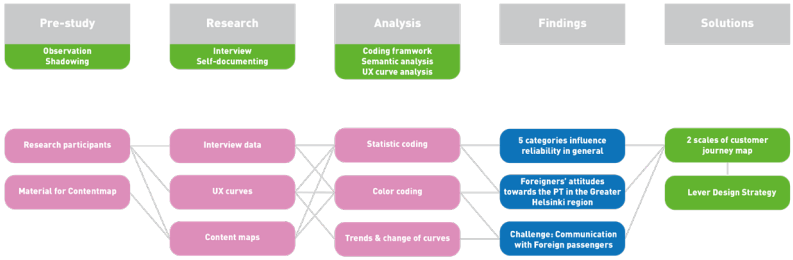

Fig.7 Methodology

The research was divided into two phases — every phase built on previous knowledge. The study carried out several rounds of iterations. In the first phase, the researcher started several rounds of observation work. In the beginning, the research goal was to understand what a public transport journey was, and the targeted research group have not determined. Thereby, at the time, I observed all the citizens. At the same time, I published a

questionnaire about HSL services. Although the content of the questionnaire is not fully able to serve this research, I found that the foreign residents encountered more problems than the locals. Combined with my observations, as well as my own life experience, I decided to lock the user in the foreign residents, which helped me narrow down the scope of this study. After that, I utilise two observation methods, non-participant observation (Stickdorn, 2018) and shadowing (McDonald, 2005), to investigate the public transport journeys. Through pre-study, I confirm the stages and touchpoints in the public transport journey. The insights gained at this stage would lay the groundwork for the second-stage self-documenting template. Through observation, I realised that the use of public transport is a daily repetitive action, thereby public transport experience can be a real-time or long-term experience. As a result, in the next phase of the survey, various methods would be applied to investigate from these two perspectives.

In the second phase, interviews and self-documenting was combined to conduct in-depth research on how to improve foreigners' reliable public transport experience. First, the structured interview in the tuning-in session helped the participants build a fundamental concept of reliability. According to Mattelmäki (2006) and Ahola (2017), through the tuning-in session, participants can be triggered to provide more informative insights into the following self-documenting session. Next, two self-documenting methods were used to evaluate public transport experience in Finnish Capital region. UX Curve (Kujala et al., 2011) was applied to evaluate the public transport experience over time. According to the findings in the first phase, I developed UX curve to investigate both long-term and real-time public transport experience. Then, a content map that is inspired by logbook (Ahola, 2017) was used to identify what content factors related to reliable public transport experience. The two different self-documenting methods helped to get insights about a comprehensive public transport experience for foreign residents through both time and content perspective, respectively. The deep interviews were conducted according to the results from the self-documenting session. The results of the second phase would be the primary sources of data for this study.

The analytical methods in this study varied. First, in this study, I coded text data into specific categories and described the categories that could affect the reliability of public transport experience. This method was used by (Ahola, et al., 2014) to investigate the safety perception in ships, which refers to

quantitative analysis of qualitative research data (Morgan, 1993). In addition to understanding what categories affect the public transport experience, this study was conducted to evaluate the public transport experience of foreign passengers in the context of the Greater Helsinki region. Colour coding would be used to describe the foreign passengers' attitudes towards public transport service in Greater Helsinki region. Hence the features that decrease the reliability perception in Greater Helsinki region would be found. UX curves provide both qualitative data about user public transport experience and quantitative data related to experience over time (Kujala et al., 2011). UX curves and content maps demonstrate the experience over time and different properties in the public transport system respectively. Through analysis triangulation, the validity of findings can be guaranteed.

Journey maps are utilised to visualize the findings from interviews. Pain points and future opportunities of improvement could be uncovered through analysing two scales of the journey maps (See section 2.2). Based on the possible opportunities in the customer journey map, a design strategy of a combination of various implementation levers is suggested

3.2. First Phase: Contextual Pre-Study

It is necessary to understand how passengers use public transport in an authentic environment. Ahola (2017) researched in an authentic environment to assess the sense of safety of passengers during the voyage in his doctoral thesis. Although most citizens are familiar with public urban transport services, the services in each country or city are different, so if I want to study public transport in the Greater Helsinki, I need to know how passengers use it in this area. This contextual research is especially crucial for non-Finnish authors, who do not have a comprehensive understanding on Helsinki public transport context although there are a lot of online reports to introduce public transport in Finnish Capital regions, such as Annual reports (2017) from HSL and public transport reports from the City of Helsinki. However, these documents report the public transport system from the perspective of public transport operators. The reports rarely cover how users use public transport, which only helps the author understand how Helsinki traffic is operated, but little help in investigating the public transport user experience. Research on user experience should be conducted from the perspective of the users (Roto et al., 2011). However, the public transport experience is different regarding different passengers and different situations. In order to understand various situations in the research, the researcher hopes to collect heterogeneous data in a short time. The observation method describes the social and cultural reality and how people relate to it. (Ahola, 2017; Dourish, 2006; Andersson, 1994). Accordingly, the observation was considered as the most suitable method for collecting insights in the context of public transport in the Greater Helsinki.

The observations result can be used as a benchmark for the author to understand the public transport experience from foreigners' perspective in the Helsinki region. The insights gained from these observations can help the author to understand the big picture of their travel journey, which is crucial for designing self-documenting templates and interview questions.

3.2.1 Methods

Convert non-participant observation

In order to observe the most natural behaviour of people using public transport in an authentic context, convert non-participant observation is considered the most appropriate method. Stickdorn argued that "Covert non-participant observation refers to observing research subjects without them knowing that they are being observed at all." Convert non-participant observation can minimize the effect of the researcher on the observation process (Stickdorn, 2018). Thus, researchers can observe the most authentic behaviours of observing subjects when they are using public transport. Furthermore, the researcher conducted this observation as a pre-study to form a first-hand understanding of the investigated subject. Because of time and funding constraints, the author was not able to recruit a large number of participants for research observation. The researcher could observe a large group of people without recruiting them by convert non-participant observation. Researcher pretended to be a passer-by and secretly observe how people use public transportation. If the local legal and ethical issues allowed, the researcher can observe research subjects even without their permission. In this study, researcher avoided taking photos or videos of strangers and disturbing their routine actions. Therefore, in the process of research, there may be some critical information that cannot be collected. For example, I am not able to investigate how passengers plan their journey before they arrive at the station through convert non-participant observation.

Shadowing

Public transport experience is a cross-channel experience. If convert non-participant observation is the only access to map out the public transport journey, there will be some information missing. Thus, author recruited two participants and shadowed them. Shadowing is a research method involving a researcher who closely observes participants for some time (McDonald, 2005). After the participants' consent, the researcher has the opportunity to follow them throughout the whole public transport process, and the researcher even has the opportunity to observe at their home. This helped complement the details of the public transport journey. Recording by photos and videos during the observation process were approved by the participants.

Although the number of shadowee is only two, the purpose of shadowing in this study is mainly to supplement the details that are not able to acquire through convert non-participant observation. Thus, there is no need to hire too many participants. In the process of shadowing, researcher minimises the observer influence on the shadowees through hidden recording and the natural conversation. Since, as Stickdorn (2018) claimed, “Research subjects often unconsciously conceal some truth when they feel observed” It is crucial to balance out observer effect and necessary close following, which will prevent participants from being influenced by author bias. Unfortunately, these observed effects are inevitable during the observation process. However, the previous non-participant observation balanced out the biases of the observer effects (Stickdorn, 2018). Therefore, all the observation results in the first phase are credible.

3.2.2 Participants

In order to cover all of the journey content in public transport and understand public transportation services from comprehensively, the author picked observation subjects randomly from Aalto University metro station, Aalto university bus stops, Central Railway Station, Vantaa airport, HSL service point, R-Kioski, Train stations, metro compartments, bus compartments and started convert non-participant observation. The chosen observation locations were transportation hubs and routes where a large number of people gathered. Throughout the process, the researcher avoided taking pictures of strangers due to ethical reasons. After the author targeted foreign residents in this study, it was challenging to pick observation subjects randomly from one site. I filtered foreigner residents through their appearance and the language they speak to cover various countries, cultural backgrounds, genders, and ages. However, after several rounds of observation, I noticed I was not able to collect some information only from public occasions. Many aspects of the public transport journey take place in private space, which is not available through non-participant observation.

In order to supplement the private information, I decided to use another method of observation, shadowing. In shadowing, it is inevitable to record while following the shadowees, so this method is easy to generate observation effects (Stickdorn, 2018). Furthermore, in order to obtain

useful information in shadowing, the researcher must know enough about the shadowees. Otherwise, the observation results will not be meaningful. Author recruited two foreign participants who have come to Finland for half a year, two years respectively. After learning about their travel plans, author shadowed them twice during different types of journeys, which are they went to familiar and unfamiliar locations respectively. The shadowing process started with planning the public transport journey at home to arriving destination.

3.2.3 Process

The author made an observation template in advance so that the observations can be recorded efficiently. The primary purpose of contextual research in this study was to understand what a public transport journey was in the Greater Helsinki for foreign residents. In addition to observing what happened, the user's feelings are also essential (Vermeeren et al., 2010). In the process of non-participant observation, I was not able to interview the observation subjects about their feelings. However, I got the information through their expressions. I will also use the stopwatch to record as accurately as possible the time spent by passengers at each touchpoint. Overall, these issues would be included in the observation template (See Table 1):

- Background information on the observed subjects, such as nationality, age.
- What people are doing
- What people are not doing
- Expressions
- The time they put into public transport services

Table.1 Template of Observation

Subjects	Gender	Age	Time	Expression	Situation

I started from the perspective of being a foreign passenger of public transport in the Greater Helsinki region. Before observing people, from my experience of using Helsinki for half a year I summarised several key touchpoints from my own experience: *HSL Application, card, card readers, ticket machines, service points, vehicles, bus stations, railway platforms, information boards.* When I went to various locations, I would pay attention to these touchpoints and observe what happened around them.

In the first round of observation, the author observed in transport hubs, which are the Central Railway Station, Vantaa airport, and a number 552 bus. According to the touchpoints concluded previously, Author observed how they buy tickets and charge their HSL cards through ticket machine, how do they use card reader, what they are doing when waiting in the stations, how they get on the vehicle, what they are doing inside the vehicle, what they are doing when they are leaving stations. The author recorded the observed content on the template and found that there is a group of people who have encountered more difficulties. For instance, they have to spend five times as much time to use the ticketing equipment, and the failure rate is also high. These group of people are foreigners. Combining the author's previous experience and acquaintances appraise on public transport in the Greater Helsinki, I found that the public transportation experience of foreigners here is not very good. The author believed that it is necessary to enhance their experience. Targeting a specific group helps the author to narrow down the scope of this study further. Below is a comparison of the time used by locals and foreigners to use the ticket machine at Vantaa airport and Central railway station.

SITE:

Central Railway Station
Vantaa airport
Number 552 bus

Table.2 Touchpoints and Observation Contents

TOUCHPOINTS	OBSERVATION CONTENTS
Application	- How do they plan the journey - How do they buy a ticket through mobile phone?
Card	-. How do they charge their cards?
Card reader	- How do they buy a ticket through card reader?
Ticket machine	- How do they buy a ticket through a ticket machine?
Vehicle	- How do they get on the vehicle? - What are they doing in the vehicle?
Bus station	- What are they doing at the bus station?
Railway platforms	- What are they doing on the platform?
Information board	- How do they use the information board?

Table.3 Observation Findings: Finnish Use Ticket Machines in Vantaa Airport and Central Railway Station

SUBJECT	GENDER	AGE	TIME	EXPRESSION	SITUATION
1	Female	20-30	35s	Calm	- Charge her card with a credit card quickly
2	Female	30-40	53s	Calm	- Observe the region interface for a while - Buy a ticket quickly - Put a ticket in the wallet
3	Male	20-30	1min2s	Calm	- Observe the region interface for a while - Buy a ticket - Put a ticket in the pocket
4	Male	20-30	1min29s	Confused	- He supposed to buy a ticket with cash, but he failed in the first ticket machine and turned to another, then he was a success to buy a ticket
5	Female	40-50	1min13s	Calm	- Buy a ticket with cash
6	Male	30-40	1min4s	Calm	- Observe the payment interface for a while - Charge his card
7	Couple	20-30	1min	Relaxed	- Discussed and buy two tickets quickly
8	Male	20-30	57s	Calm	- Charge his card quickly
9	2 Males	20-30	1min30s	Calm	- Charge the cards while communicating with each other
10	Female with wheelchair	30-40	1min24s	Confused	- Stare at screen for a while - Buy a ticket

Table.4 Observation Findings: Foreigners Used Ticket Machine in Vantaa Airport and Central Railway Station

SUBJECT	GENDER	AGE	TIME	EXPRESSION	SITUATION
1	Couple	20-30	3min45s	Calm	- They discussed for a while in front of the region interface - Buy tickets - Keep tickets in the wallets
2	Female	20-30	5min	Confused	- Check her phone in front of a ticket machine - Compare the information on the interface and her phone - Buy a ticket - After 5mins buying ticket, she observed the station. - She did not know how to use this ticket and put the ticket to the card reader
3	4- member Family		7min03s	Serious	- Read Helsinki Map - Compare map and ticket machine - Parents discussed - Compare map and information board in the platform - Buy tickets - Father distribute the tickets to everyone - They keep the paper ticket in their wallet mezzanine
4	Female	30-40	3min44s	Confused/ Nervous	- Change the ticket machine - Observe others' operation - Ask for help - Buy a ticket under locals' instruction
5	Male	50-60	5min43s	Confused	- Observe the front interface for 1 min - Observe the people beside him - Go back and do it himself - Jump back and forth between interfaces - Look around - Staff come and help him and buy a ticket - Put the paper tickets inside his pocket
6	3 Males	20-30	6min3s	Relaxed	- Check handbook - Found they can buy tickets together - Compare handbook and interface - Everyone put a ticket in their wallet
7	Male	40-50	2min11s	Embarrassed	- Do not know how to buy a ticket - Ask for help - Buy a multi-day ticket under staff' instruction - Did not know the difference between different train
8	Female	50-60	Failed	Embarrassed	- She tried two ticket machines, but both failed. Then she left the station
9	5-member Family		7min5s	Confused	- Observe the information board - Father took a photo from the information board - Discussed with photos - Daughter bought five tickets for all in HSL APP in the end
10	Male	20-30	Failed	Frown	- Compared to the ticket machine interface and his mobile phone - Observe others - Left platform

After the decision to focus on foreigners, the author started the second round of observations. The primary purpose of this observation is to supplement the insights about public transport journey from foreigners' perspective. This time I chose the location where there are large amounts of foreigners gathered, such as Vantaa airport, Central railway station, Aalto University and some route pass by these locations. The author picked foreign observation subjects from the appearance characteristics and languages they spoke. Although such a filtered method may have some limitations, the primary purpose of this observation is to supplement the information that may have been missed in previous studies. More insights can be obtained in the in-depth research in the next phase.

Furthermore, the author noticed that just by convert non-participant observation, some vital information is missing. For instance, I was not able to observe how people use their public transport application on their mobile phone. As a result, author recruited two participants and shadowed them when they are using public transport in two different situations. One is that they visited a new place and the other one is a familiar place. Throughout the process, authors tried hard to minimise the observer effects on participants while following them closely to acquire useful information, because when participants notice they are under observation, they might be nervous and provide false information (Mcdonald & Simpson, 2014). In order to avoid this situation, the author tried to hide the record action and the interviews throughout the shadowing the was conducted in the form of natural chat

The observation results would be applied to the second phase. Several rounds of observations help narrow down the scope of this research. Hence the selection of participants in the second phase was determined. Furthermore, Observation of behaviour supports the self-documenting data and to form the research questions.

Fig.8 Shadowing: Purchase A Ticket

Fig.9 Shadowing: Plan The Journey with Application

Foreign Residents as Intermediate

After the first round of observations, the author found that foreigners need to spend more time than locals when using the use of various services in the public transport system. The needs of foreigner passengers are different from that of locals. When the differentiated needs are met, passengers will use public transport to explore the city. However, if we consider the differentiated needs of foreigners and locals together, there will be many heterogeneous results. In order to narrow down the research scope, this study, therefore, targeted foreigner passengers as research subjects,

Although this study aims to enhance the experience of foreigners, some problems may occur to the local when improving public transport experience for foreigners. The design solution should balance the experience of both foreigners and locals. It is not feasible for local public transport authorities to improve the experience of foreigners while damaging the experience of local people. These have brought problems to the research.

Through shadowing, I found that different foreigners had come to the Greater Helsinki region for different periods of time, and they had different levels of understanding of the public transport system. Therefore, foreigners in the Greater Helsinki region can be divided into two types, one is travellers, and the other is foreign residents who work or study in the Greater Helsinki region. These foreign residents have a transparent growth process. When they just arrived, like tourists, they were relatively unfamiliar with public transport services. As time went by, they gradually learned to grow and use public transport like residents. This group of foreign residents can be regarded as intermediate, and they can connect novice users, “foreign tourists” and expert users, “residents (Cooper, Reimann & Cronin, 2007). Thus, the solution for improving foreign residents’ public transport experience can also help both foreigners and the locals. Overall, the research subjects of in-depth research in the next phase was targeted in foreign residents.

Public Transport Journey

Through three rounds of observation, the author discovered that everyone's public transportation experience is not precisely the same, but the whole journey can be roughly divided into three stages. In each stage, passengers need to complete several interactions with public transport services (See table. 5). The division of public transport journey benchmarked the self-documenting of the second phase.

Table. 5 Three Stages of The Journey

Plan	· Plan the trip · Going to a stop · Stay in a stop
Validate Ticket	· Purchase a ticket (through the different channel) · Charge the card
Travelling	· Embarking · Onboard · Disembarking · Arriving at a final station · Arriving at destination

3.3 Second Phase: User Research

The interviews and self-documenting sessions are combined in this phase. Public transportation is an activity that people repeat every day. Time is an essential factor affecting user experience. Moreover, public transport service is a large and complex system, and passengers' perception of properties in the public transport system naturally compose their user experience (Roto et al., 2011). Accordingly, this study would investigate user experience from both time and system properties perspectives. These insights from literature help author choose suitable methods for the research.

Interviews

Interviews in this research were divided into two parts. The first part, which was a structured interview occurred in tuning-in session, helps participants acquire the right mindset. Hence, they would provide informative insight

during the self-documenting session. Then, there is an unstructured interview following self-documenting session. Gorden (1969) and Ahola (2017) argued that when it comes to personal experience, an unstructured interview could provide more informative data than a structured interview. In this study, the information collected in self-documenting session would contribute to the final unstructured interview.

Self-documenting

In this study, the public transportation experience should be evaluated over time and public transport system properties. Time is abstract, and the properties of the public transportation system are diverse. Thus, the participants' self-documenting helps the researchers interpret the relationship between insights and these two factors (Mattelmäki, 2006). This is helpful for subsequent analysis with journey map as analysing qualitative insights requires a lot of interpretative works.

3.3.1 Methods

In this phase, two self-documenting methods were utilised. First, the content map, which was inspired by logbook (Ahola, 2017), was used to evaluate people's safety experience in a ship environment. The content map would be utilised to evaluate passengers'' perception towards the properties of the public transport system. Then UX curve (Kujala et al., 2011) would be used to evaluate public transport experience over time.

Content Map

The content map was used to evaluate passengers' perception of the properties of the public transport system. The path in the content map illustrates the public transport journey and the empty slots below indicated positive and negative factors influencing a sense of reliability. The whole journey was divided into three stages, plan, valid ticket and travelling. Different colours distinguish the three stages in the content map. Every slot in the journey corresponded the properties in the public transport system. The content of public transport journey comes from the observation result in the first phase.

The content map is a variant of the logbook (Ahola, 2017). Participants in Ahola's (2017) research used the logbook to document their positive and negative feelings when they explored their environment. According to Ahola (2017), Csikszentmihalyi and Larson (1987), logbook minimise retrospection. Hence, researchers understand context-related experience efficiently. This character helps participants recall the experience occurred in the context without consuming much energy. In this study, due to time and funds constraints, participants would not be required to record their feelings while riding public transport. A content map will help participants recall their experience in terms of properties of the complex public transport system and document positive and negative point of views considering each journey steps. A large amount of qualitative data was collected in a short period of time.

Through observation, the author found that public transport experience varied. Accordingly, public transport journey in the content map is not a coherent journey. Instead, it is divided into three different stages, which reduces the likelihood of participants being confused. The first step is planning the journey during which commuters might use HSL Application or Google map, stay in a station and read the information board. The next stage is validating tickets or charge transport card. Commuters could get tickets by four different accesses, which are HSL application, card reader, ticket machine and ticket points. The last stage of the journey is traveling. Commuters embark and disembark the vehicle; on board a vehicle and leave stations to head to destinations in this stage. Content map could evaluate a collection of momentary UX that foreign passengers interact with different touchpoints in a public transport journey. Episode UX refers to a coherent use of a product or service experience consisting of a series of momentary UX (Roto et al., 2011). Thus, the content map could be utilized to evaluate episode public transport UX.

UX Curve

The UX curve is a simple template that participants can draw a curve in the two-dimensional graph area and lines for writing and briefly explaining the change in the curve (Kujala et al. 2011) foreign passengers use public transportation services on a daily basis. Therefore it is necessary to assess how the public transport experience changes over time. The UX curve can

evaluate the long-term and repeat user experience and provide rich qualitative data describing the change of UX over time (Kujala et al. 2011). In terms of the implement, the UX Curve is less cumbersome and allows more users to participate compared to interviews (Kujala et al. 2011). Furthermore, the more straightforward the process of qualitative research is, the more likely participants are to record more of their insights (Ahola, 2017). The UX Curve is simple enough to fill when participants recall travel experience so that participants do not need to take extra effort to take notes. Moreover, I am more likely to explain to the participants how the self-documenting work. In summary, the UX Curve is a suitable method to evaluate the UX over time in this study.

According to the time span of user experience, public transport experience can refer to monetary UX, episodic UX or cumulative UX (Roto et al. 2011). Kujala et al. (2011) conclude that evaluate monetary UX in most cases, is not reliable. Episode UX refers to the experience of using public transport service once while cumulative UX refers to the long-term public transport experience. Evaluating these two kinds of user experience would provide a different insight. As mentioned before, the content map could evaluate episode public transport UX, thereby UX curve; in this case, was utilized to evaluate the cumulative UX.

At first, the author wanted the participants to record their experience from arriving in the Finnish Capital region to recent. However, participants are living in the Helsinki for a different period, thus using the same UX Curve template may maybe wouldn't provide comparable data. Fortunately, during the thesis project (in April 2019), HSL services underwent a relatively significant change. HSL changed their zone and ticket system on that day, which was a considerable change for residents. The changes in the user's public transportation experience during this period may bring some insights to the research. Furthermore, accepting the renovating service is similar to using an unfamiliar foreign public transport service. Therefore, the author specially marked this time point as the starting point in one of the templates of the UX curve.

3.3.2 Participants

Thirteen foreigners who were living or traveling in the Finnish Capital region participated in the research (See Table.6). The usage period varied from a few days to two years. Eleven participants experienced changes in HSL services, and two participants had no experience because they had been in the capital for too short a time. So, the interview content will be adjusted according to their situation. Author recruited participants from different countries and regions. Their earlier experiences with public transportation varied. The age group varies between 20-40, and most of the participants are living in Helsinki.

Table. 6 Participants

INRERVIEWEE	GENDER	AGE	NATIONANALITY/ REGION	BACKGROUND
1	Female	27	Vietnamese	Student
2	Female	27	Chinese	Urban planner/ Engineer
3	Male	30	Chinese	Software
4	Female	35	Japanese	Chemical engineer/ Student
5	Female	31	Indian	Software Tester
6	Male	23	Chinese	Advertising
7	Female	23	UK	Student
8	Female	25	Hongkong	Student
9	Female	30	Taiwan	Designer
10	Male	25	Chinese	Designer
11	Male	24	Chinese	Student
12	Male	27	Mexican	Sale assistant
13	Male	26	Egyptian	Dentist

Participants filled out demographic information before self-documenting, and author clarified that their name would not appear in published documents. All the information they provided would only be used as a source of data for this study.

Most of the discussion was in English. However, the author's mother tongue is the Chinese language, and there are also several Chinese in the participants. Thus, the author would communicate with them in Chinese. All the Chinese dialogue would be transcribed into English later. All paper materials are in English.

3.3.3 Process

First, to involve participants in the context of the study instantaneously, participants would be initiated with a tuning-in session. A tuning-in session can motivate participants to provide more valuable information for research (Ahola, 2017). According to Mattelmäki (2006) and Ahola (2017), “a tuning-in session promotes the success of the research and helps trigger informant insights and expectations.” The tuning-in session is a structured interview. They would be asked to talking about reliable public transport experience in general, which would help them acquire the right mindset of this study. Then they would be asked to share their previous reliable and unreliable public transport experience separately. In the end, the author will turn to the question about public transport experience in the Finnish Capital region when they first came to Finland.

Second, an empty UX curve template was given to the participants. The participants were asked to document their reliability perception during the time period after HSL changed zone division or after they arrived in Helsinki. These periods did not exceed two months. The change includes a new zone and tickets system. Participants are encouraged to explain why the curve changes and they can also write it down.

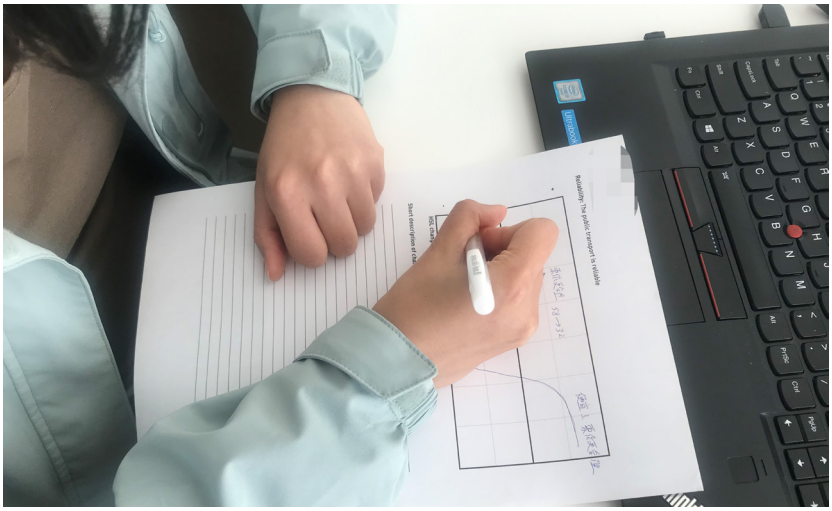

Fig.10 Participant Is Drawing UX Curve

Third, to allow participants to recall their feelings throughout the intricate system without having to spend the extra effort, the content map will be offered to them. The participants would be encouraged to record the issues that have a positive or negative effect on the reliability among these touchpoints.

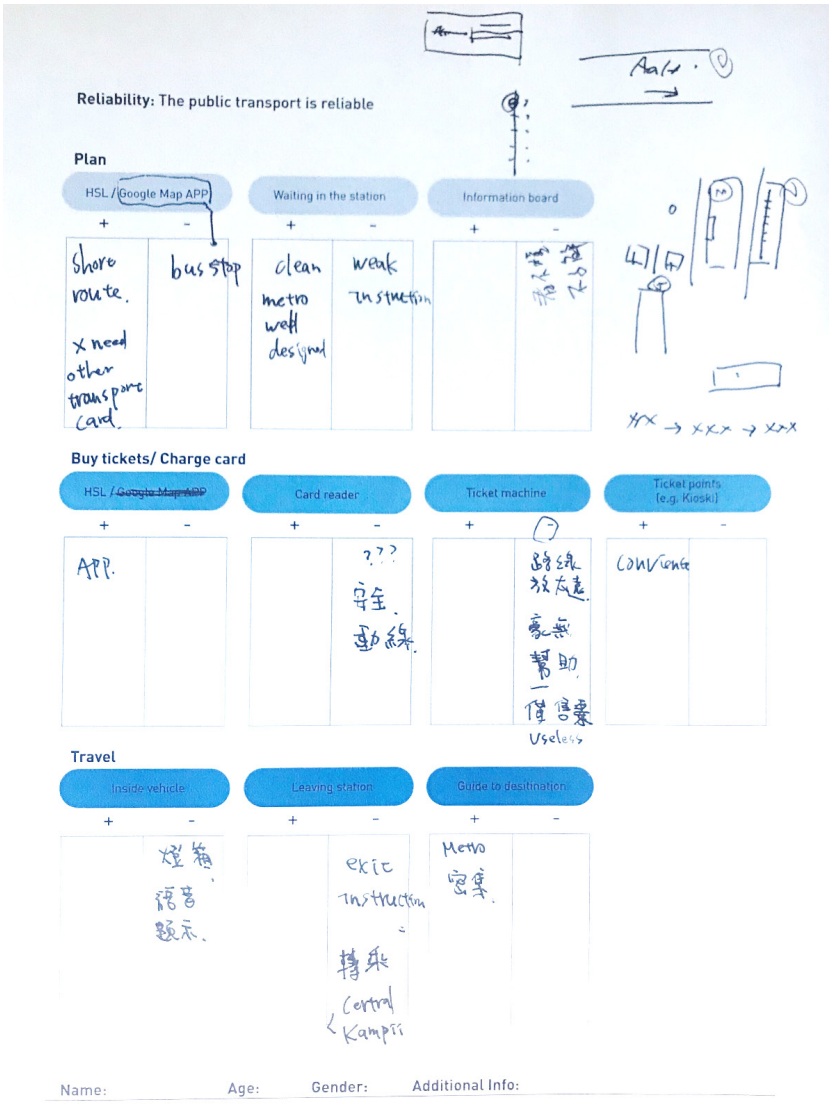

Fig11 An Example of Content Map Drawn by A Participant

At last, the author conducted unstructured interviews based on the data from the self-documenting session to acquire further insight as the author was not able to predict what participants would have documented.

3.4 Data Analysis

The interviews were audio-recorded. 3h 47 min audio data was transcribed to 34 pages of text that was semantically analysed. The reasons described the curve change were documented in the curve template were picked out. the attributes among different touchpoints were picked out from the content map as well. All the multi-source data were divided into three categories according to semantic analysis, UX curve level and positive and negative blanks in content maps. All the data were coded with colour. And then the data was extracted into featured and categorized into explicit categories by the approach of the coding framework. In the end, the UX curve trends were analysed separately. This study used different analytical methods to analyse the data. Method triangulation ensures the validity of the findings.

3.4.1 Classification and Colour Coding

Both quantitative and qualitative research methods were applied to data analysis in this research project. I analysis data by coding content from interviews, content map and UX curve into categories and described them by statistics, which refers to quantitative analysis of qualitative data(Morgan, 1993; Ahola et al., 2014.). Ahola et al. (2014) used this analysis approach to study how passengers perceive safety onboard a ship. This study is similar to those of Ahola et al. that is, the implicit meanings of data are to be found from latent textual content (Babbie, 1992; Morse and Field, 1995; Ahola et al., 2014)

I analysed the research data and divided the transcribed interviews and documenting materials into five categories which are related to the reliability of public transportation experience. The colour code is adopted to reveal the positive and negative impact of extracted features on the public transport

experience of foreigners in the Greater Helsinki region. First, the author extracted a lot of reliability-related features from each transcribed interview and self-documenting material. As a result, the authors obtained 423 reliability-related features. 399 of the 423 were illustrated in the coding framework since the remaining features were only mentioned once. Next, 399 features were aggregated into 34 groups based on their commonalities. Then, 34 groups were divided into 11 clusters which were under 5 categories which are relevant to reliable public transport experience.

In addition, based on the coding framework proposed by Ahola et al.(2014), I added the colour code to reveal positive or negative effects of coding features on foreigners' public transport experiences in the Greater Helsinki region. Because in this research project, I not only investigate the factors relevant to general reliable public influence experience but also studied the impact of different elements on the real public transport experience of foreigners in the case of Helsinki. In the previous research, the content in the content map and UX curve were divided into a positive and negative position. In order to incorporate position characteristic into the data analysis, the colour code will be applied to the coding data. Three colours, green, blue and yellow, represents the positive, neutral and negative position respectively.

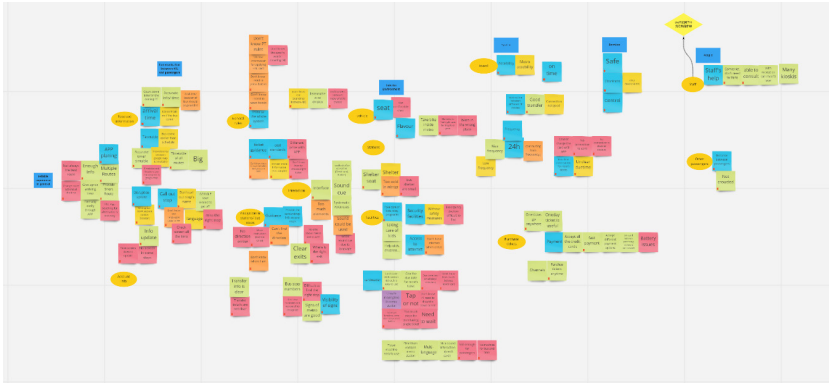

Fig.12 Colour Coded Data

The column charts represent categories, clusters or groups. The proportional of the three colours represent the proportion of positive, neutral, and negative speech when the participant describes the relevant features. In this way, it could reveal what features can be improved to enhance foreigners' public transport experience in the Greater Helsinki.

There are several ways to divide the textual material into positive, neutral, and negative positions. The first approach is semantic recognition. There are several questions like "What is reliable public transport in general?", "What do you think the public transport in the Greater Helsinki when you just came here?" in the interview. The answers to these questions could be determined by semantic recognition. When participants were describing their experiences in public transportation in Helsinki, if the words "good", "reliable", "convenient" appeared in the statement, I would allocate the described feature in positive colour. On the contrary, if there were words like "bad", "unreliable", "terrible", the feature would carry negative influence to the reliability of public transport experience. When participants described a feature is crucial to reliable public transport experience in general, they represent a neutral position. For instance, many participants described that frequency is essential for public transport reliability. They do not explain the frequency of public transportation in Helsinki, so the frequency mentioned here is neutral. Most of the answers to the first question about the general reliable public experience are neutral features. I carefully checked the participants' positions in the interviews so as not to mis-classify them.

Secondly, In the interview, there were questions about "reliable public transport experience" and "unreliable public transport experience". These questions guide participants to separate their stories into positive and negative positions. Therefore, the transcribed materials can be classified as positive and negative. Furthermore, the Content map and the UX curve also guide the participants to describe their public transport experience in the Helsinki Region from the standpoint of positive and negative. Thus, the features in self-documenting materials can be easily divided into positive and negative positions.

3.4.2 UX Curve Trends and Change Reasons

The 13 UX curves were illustrated together, and prevailing trends were found. The trends explained how public transport experience of foreign passengers changed over time. The trends were described according to both reasons the participants documented on the UX curve templates and the attitude level.

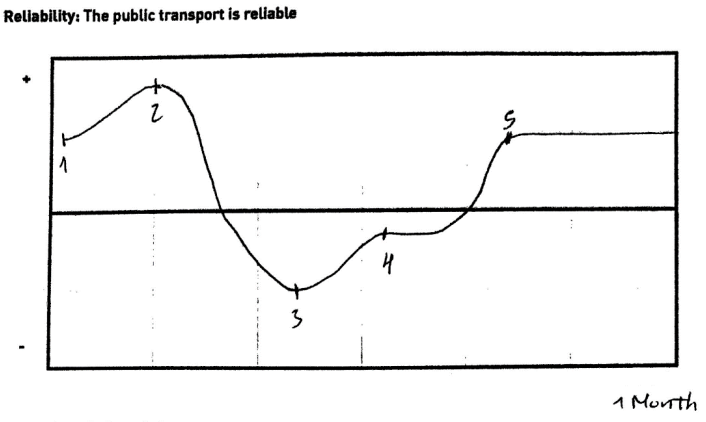

Fig.13 An example of UX Curve Drawn by A User

INTRODUCTION
LITERATURE REVIEW
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4

4. Results

The results of this study will be presented as follows: Five categories that could describe reliable in general are analysed through statistic coding. Then, colour coding reveals the problems that foreigners met in public transport services in Helsinki concerning clusters, groups and categories. After that, the trends of 13 UX curves indicate the learning process when foreigners use public transport in the Greater Helsinki region. Finally, all the results are illustrated vividly in the form of two scales of the customer journey map, through which I presented the research the results of this study to HSL experts.

4.1 Categories in Coding Frameworks

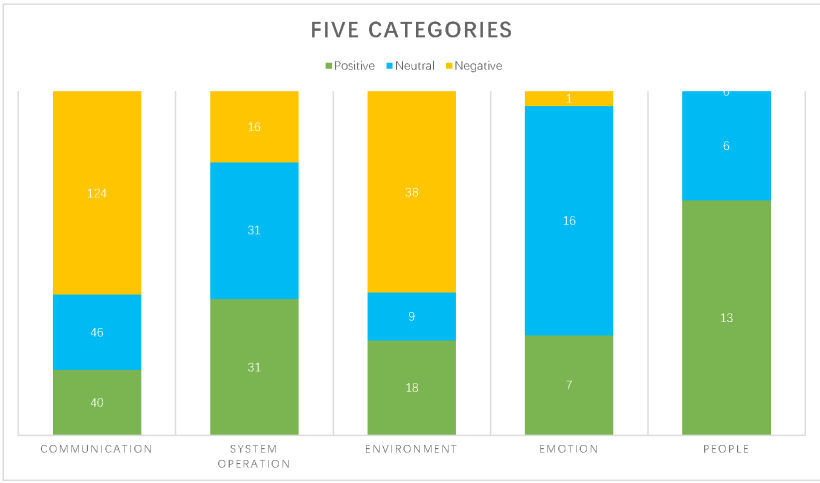
This chapter demonstrates five themes that affect public transport, which was analysed from the coding framework. These five categories will be described as objective factors according to quote coding. Then, the colour code which presents the participants' subject view on public transport in the Greater Helsinki would be explained.

Table.7 Classification Coding Frameworks

Category	Quotes	Cluster	Quotes	Group	Quotes
Communication	210	Received information	102	Report stops	28
				Arrival time	19
				Disruption	19
				App planning	18
		Navigation		Timetable	18
			50	Guidance	22
				Exits	18
		General rules		Stop signs	10
			49	Ticket	30
				Helsinki PT rules	14
				Zone division	
		Interaction		Sound	5
			9	Interface	5
					4
System	81	Travel	65	On time	31
				Frequency	13
				Account	10
				Connection	7
				Accessibility	4
		Purchase	16	Payment	7
				Channels	6
				Types	3
Environment	65	Facilities	39	Card reader	18
				Ticket machine	9
				Internet	5
				Accessibility facilities	4
				Security facilities	
				Shelter	3
				Seat	
		Station	16	Bicycle compartment	16
		Vehicle	10		5
					5
Emotion	24	Emotion	24	Cleanliness	14
				Safe	7
				Control	3
People	19	Other passengers	12	Crowd	12
		Staff			
			7	Staff	7
Total	399	13	399	36	399

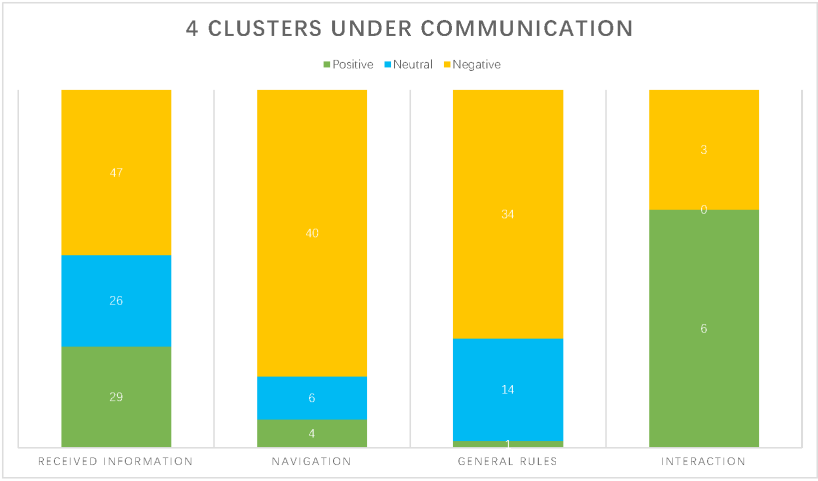
4.1.1 Communication

Graph.1 Colour Coded Five Categories



The most frequently mentioned features that affect the reliability of public transport experience are from communication categories (52.6%), These features are divided into four clusters, which are received information, navigation, general rules and interaction. Regarding the public transport experience in the Greater Helsinki, over half of the quotes (59.0%) in the category communication presented negative implications.

Graph.2 Colour Coded Four Clusters under Communication Category



In Received Information cluster, the participants described reliable public transport experience in terms of the report stops, a notice of arrival time, disruption information the planed journey from APP and timetable. They want to get real-time information about the journey as well as the planning of the journey. Foreign participants explained that they are especially afraid of missing the right bus stop in an unfamiliar city, so they want to estimate when they should get off according to stop reminders. Although they "tried hard to remember the name of stations in a foreign language", their ultimate goal is to get off at the right stops. For these foreigners, it's not easy to remember the voice reminder or the notice on LED screen (in foreign language). They "must focus all their attention on the LED screen or navigation application" because they are insensitive to unfamiliar languages and hard to remember the information. The participants do not know where they are, which contributes to unreliability to some extent.

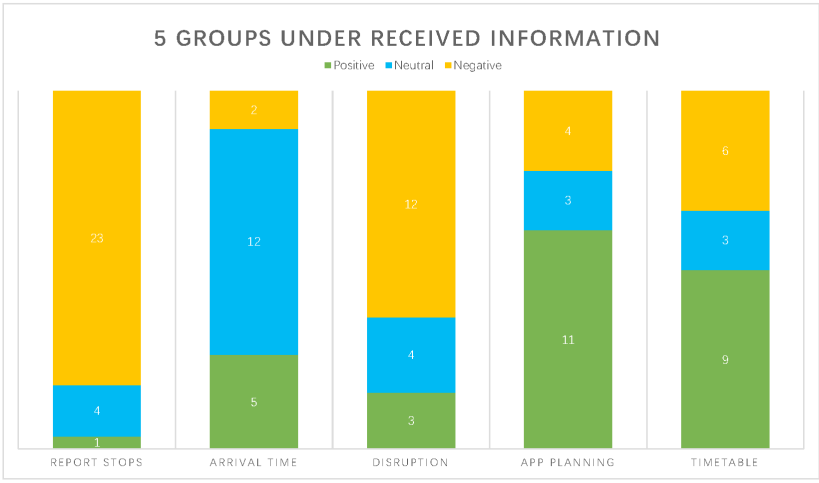
Some passengers described that "when I am waiting for a bus with the screen count down the arrival time, they feel very reliable". If the bus fails to come because of the disruption, they hope to get relevant information in time. They explained that "if the bus does not come, but they do not know what happened, they will not know how to proceed following the journey", which leads to a strong sense of unreliability. Interestingly, some passengers stated that even if disruption or late public transport happens, they won't feel unreliable as long as they are notified in time. For example, one participant pointed out that "Disruption happened, but public transport companies provided a viable alternative, I thought that public transport is really reliable". Foreign passengers also emphasized the importance of planning their journeys, mainly by navigating applications and timetables. Planning a journey is especially significant when people travel to an unfamiliar country.

The participants mentioned that bilingual information in the public transport system of the Greater Helsinki confused them at first. 23 of 28 quotes are related to the unreliable experience about bilingual get off reminder. Finnish and Swedish, which flip around on the bus stop announcements screens, make many foreigners miss the name of the right bus stops. The foreigners had to check the Google map all the time, which leads to unreliability. It is worth noting that although bilingualism is the cause of the confusion, the fundamental need for foreign passengers is to remind them to get off in a simple way when appropriate.

The participants admired the public transport in the Greater Helsinki is always on time as the screen and applications show, but they criticised the lack of disruption notice. The participants mentioned that they would wait for a long time if they did not know about disruption occurrence in time. Some participants reminded that they had a terrible cold because they had waited for a long time in the chilly winter and some missed essential appointments. These seriously harmful consequences make them very angry and think that public transport is very unreliable, although most of the time, public transport in the Greater Helsinki is on time, they have been impressed by such unreliable events. The participants were impressed by these negative sensations because they believed that public transport services did not help them to achieve their travel goals. General speaking, uninformed disruption can disrupt passengers' travel plans and make them feel unreliable.

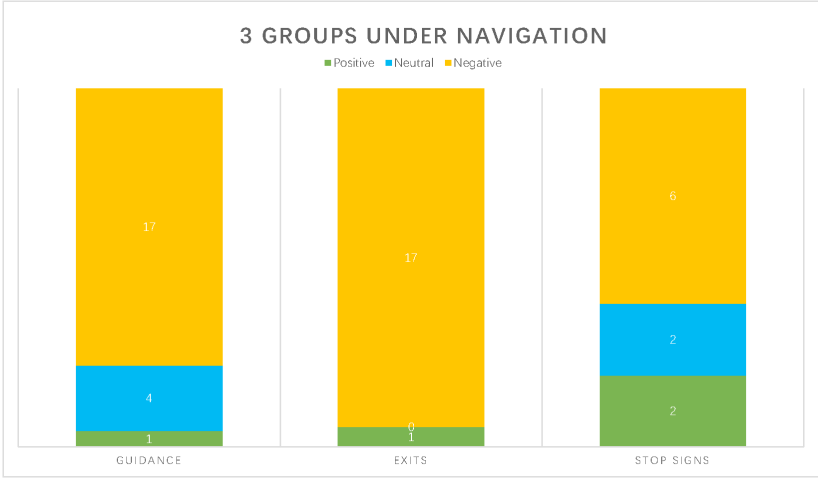
Most participants identified that it is easy to plan the journey with the help of google map and HSL application. But sometimes the inconsistent information (such as, schedule, bus stop information and so on) between the two applications make them feel unreliable.

Graph.3 Colour Coded Five Groups under Received Information Cluster



In terms of navigation, participants passengers highlighted the guidance between different transport modes. The participants hope to shorten their transfer time through easy-to-read guidance. The guidance also refers to the route maps and zone division map. In addition, the participants believe that finding the right stops and exits easily is also conducive to a reliable public transport experience. They do not want to waste too much time looking for a way “because it may disrupt their plans.” Overall, easy-to-read and understandable signs and instructions are needed to guide passengers to move in the public transport system.

Graph.4 Colour Coded Three Groups under Navigation Cluster



Graph.4 show that 80% of quotes demonstrate the negative impact of unclear navigation on the reliability of public transport system. The participants believed that weak instruction extended their transfer time. This makes it impossible for them to estimate the time spent on using public transport. This uncontrollable factor triggers a sense of unreliability. The participants also argue that the route maps are designed simply and beautifully, but the information provided is so limited that it is difficult to make decisions based on that. The participants also mentioned that when they travel by metro in Helsinki, they do not know which exit to leave from, so that sometimes they have to make a detour and delay time. But they admired the entrance of the

Metro because it was easy to identify the signs of the metro. However, the right bus stop is hard to find. They sometimes take in the opposite direction when they just came to Helsinki. Most participants do not know that each bus stop has a corresponding code. In general, navigation is not clear and needed information was not provided. Some useful indicators are not known to foreign passengers.

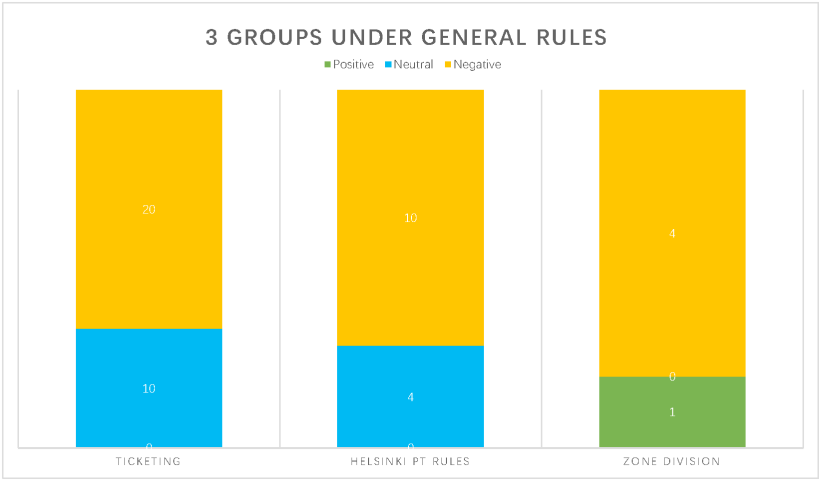
Understanding the general rules of public transport beforehand also increased reliability perception. This may be neglected by many public transport organizations because the public transport service was initially designed for local citizens who have known the local public transport very well. When foreigners come to a new city, they do not know the local traffic rules. The service modes of public transport are different among countries. If foreign passengers do not know this information in advance, it will cause unexpected interference in the process of taking public transport, resulting in unreliable public transport experience. The participants called attention to the ticket, in particular." There are always many problems when buying tickets." They consider "how to choose the right ticket" as the most challenging part when buying public transport ticket in a new country. They have too many choices and need to consider the appropriate zones and time periods. But when they first came to the new city, they did not know where to find the information. Passengers hope to find the information quickly and get the right ticket. In terms of general public transport rules, the participants hope some rules that are taken for granted could be taught to them. For instance, some Asian participants do not know they should wave hands to stop the bus in some European countries. In general, passengers' interactive process in the public transport system should be introduced to them beforehand.

69.4% of the general rules categories quotes shows inadequate communication about general rules. General rules are some rules taken for granted by local people. HSL may underestimate their importance to foreign passengers because there is only one positive quote in this cluster. For example, some Asian participants mentioned that they did not know they need to know to wave hand to stop the bus so that they wait for a bus for half an hour. One of the participants described her psychological process after that:" I realized the difference between Helsinki and my own country, so on the in the next journey, I hesitated to use public transport because I was afraid of making mistakes because I do not understand the rules. Recently, the public transport modes varied in Great Helsinki region. Bicycles,

scooters, shared cars become normal. Some basic traffic rules should be communicated to foreign passengers in case.

66.7% quotes show unreliable words on ticketing system in Helsinki. First, many participants think the ticket guidance is too simple that it does not help them at all. For example, the zone division map on the ticket machine only shows the zone boundaries and airports location. Passengers do not know which ticket to buy through the map. The participants explained that they determine the type of ticket they should purchase based on others' travel log. Some participants argued that if they could not access the Internet, they would struggle to purchase a ticket. The participants also called attention to the material of the ticket. They consider it is unreliable to keep a small piece of paper. Generally speaking, shortening the thinking process of ticket purchasing can help reduce disruptive factors when foreign passengers plan their journey.

Graph.5 Colour Coded Three Groups under General Rules Cluster

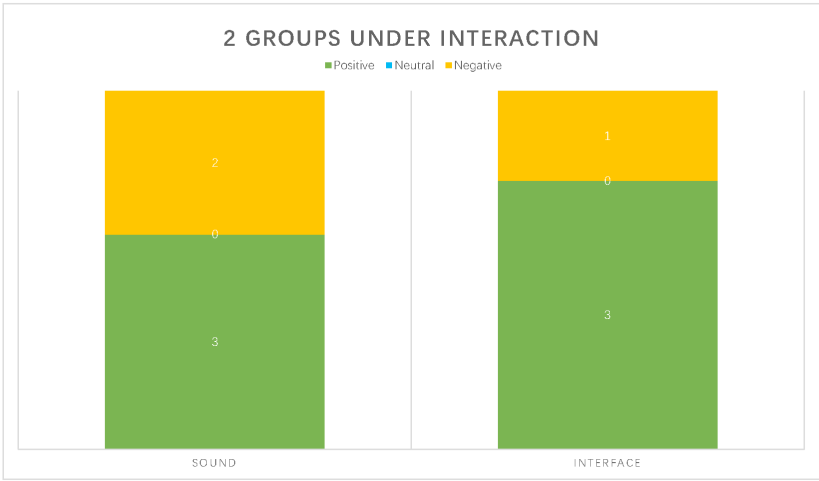


The participants admired multi-sensory interaction when they are using public transport in foreign countries because they do not understand the language. Sometimes visual information makes no sense to them. They argued "the sound is particularly important if I want some feedback from guidance applications or equipment in the public transport system "; "the

sound feedback assured me that I had done the right thing".

As Graph. 6 shows, most participants think the interactions are reliable. They admire the sound elements of interaction. For instance, they consider the sound that reminds taking away the bank card in a ticket machine is beneficial. They think the service is so considerable that they can rely on the public transport system. They proposed that the sound can be used for more functions.

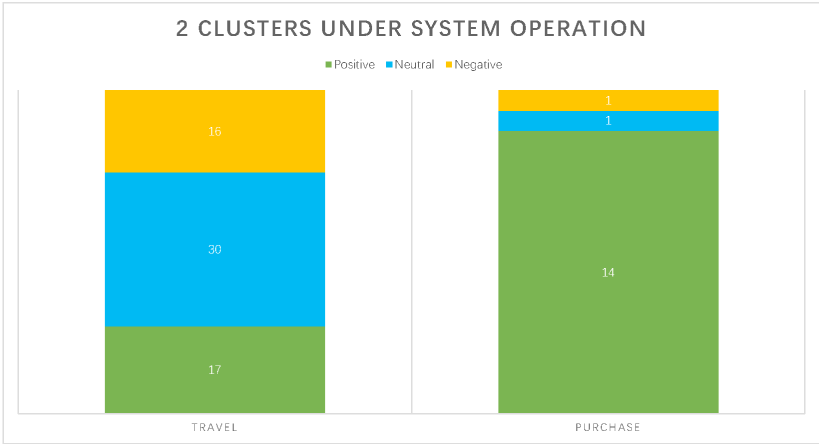
Graph.6 Colour Coded Two Groups under Interaction Cluster



4.1.2 System Operation

The participants mentioned the importance of system category second most often (20.3%). The system category includes clusters of travel and purchase. In general, foreign passengers have a positive attitude towards the public transportation system itself — 79.5 % quotes in this category show positive and neutral position.

Graph.7 Colour Coded Two Cluster under System Category

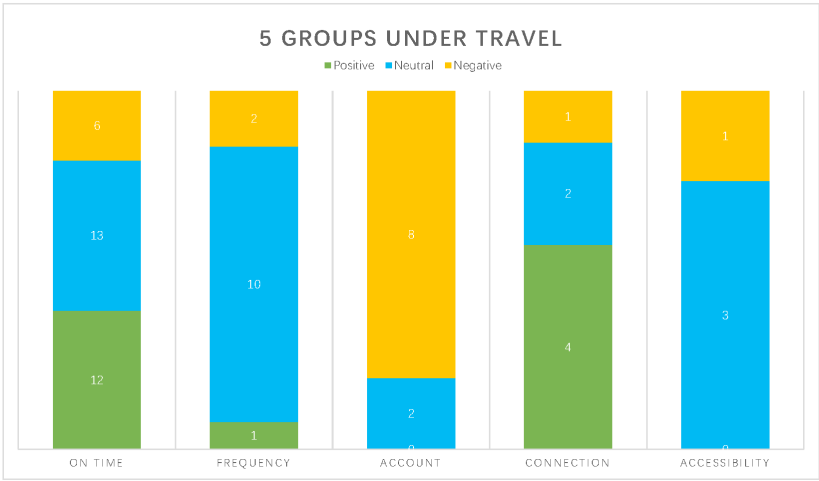


In the cluster of travel, the participants consider the “on-time” the most critical reliability feature: “the bus should come on time as the screen/ application showed”. The notion is interesting because even if the bus came later for a few minutes, and the application or screen had shown the change, the passengers still think it was on time. The other qualities of public transport service like proper frequency, connection and accessibility also played an important role in formulating reliable public transport experience. For the foreigner residents, it would be useful that the account information could be checked from a personal end.

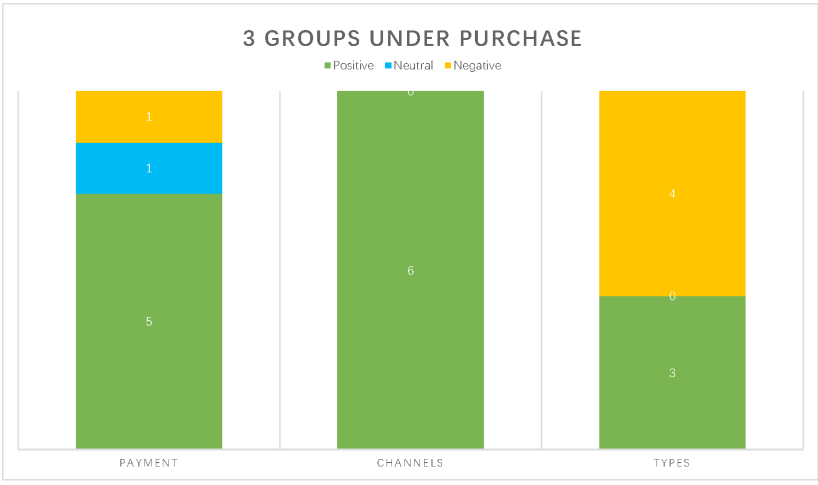
The smooth purchase process is also highlighted in the cluster of system operation. The passengers considered that different payment approaches had a positive impact on reliability perception. They hope ticketing accept “different credit cards” or “cash”. They also mentioned that multiple payment

channel options should be provided in case they were not able to operate on one channel. For example, one participant was not able to pay for the ticket in the ticket machine, but she could pay it on a mobile phone, which is a relief for her at that moment. To avoid the trouble of purchasing tickets, some participants hope to have bus tickets for tourists: “all public transport in cover can be achieved with only one payment operation”.

Graph.8 Colour Coded Five Groups under Travel Cluster



Graph.9 Colour Coded Three Groups under Purchase Cluster



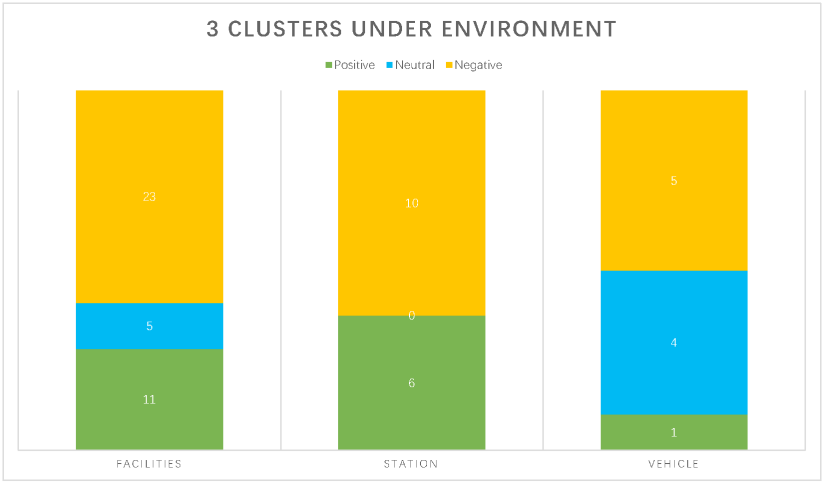
The participants identified that the good quality of public transport service in Helsinki contributes to reliability perception. The only feature that they are not satisfied is the account information which is come up by foreign residents. They mentioned that the due time shown on the card reader is too small to read, and the card is the only channel they can check the account information. They proposed that the HSL application should connect to their account.

4.1.3 Environment

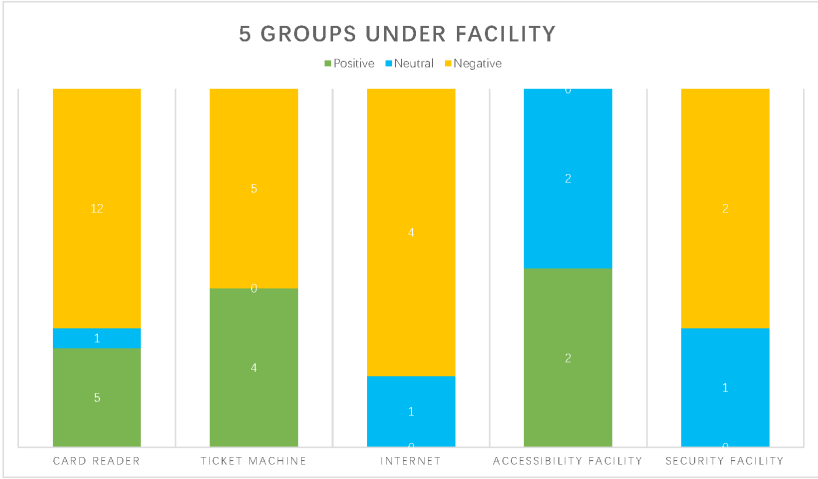
The participants mentioned the category environment 16.3% of the time, and it includes clusters pertaining to all facilities in the public transport system and the interior environment of station and vehicle.

Although the features under environment cluster are not mentioned much (only 9 quotes) when the participants describe the general reliable public transport experience, when they use public transport in the Greater Helsinki region, the environment-related features become critical to the sense of reliability, because of the lousy weather in Helsinki and the complex ticketing system.

Graph.10 Colour Coded Three Clusters under Environment Category



Graph.11 Colour Coded Five Groups under Facility Cluster



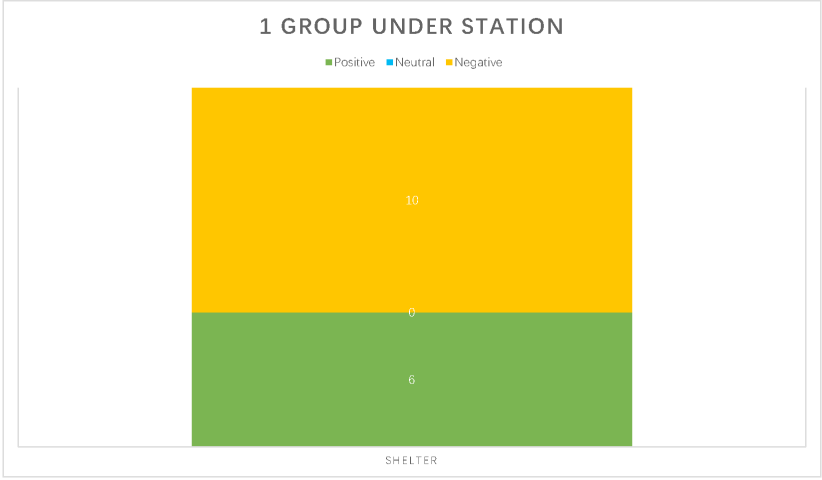
In the facility cluster, participants had the most to say about the ticket equipment. They concern about “the ease of use”. They hope that even if they use the machine for the first time, they can operate under the guidance of the equipment itself. They also highlighted the importance of the number of ticket facilities. In addition, recently, they could purchase a ticket on their mobile phone, so access to the internet plays an important role when they just arrive in a new country. The presence of accessibility facilities and security facilities are also mentioned. Even if they do not need to use these them, the presence will make them feel reliable.

As Graph. 10 shows that it is mainly ticketing facilities influence the feeling of reliability when foreigners use public transport in Helsinki. The complex operation of the card reader and the lack of ticket machine decrease the reliability perception of foreigners. The participants mentioned that they feel unreliable when they are not able to access the internet when they just arrive Helsinki. Participants also pointed out that witnessing the care of Helsinki’s public transport services for the elderly, the sick and the disabled has increased their sense of reliability. Some participants also admit that some of the necessary security measures are not placed in a conspicuous position, which will reduce the sense of reliability.

For the environment inside stations/stops and vehicle, the participants perceived reliability in terms of comfort and space. The participants highlighted the importance of shelters for bus stops, especially when passengers encounter extreme weather condition. They mentioned that the shelter help keeps away from “coldness” and “rain”. When the passengers are in-vehicle, they called attention to their personal space, where they can take care of their stuff, including luggage, bicycles, and so on. In a word, this requires that the interior environment of the vehicle should not be too crowded, and there should be carriages specially designed for bicycles, etc.

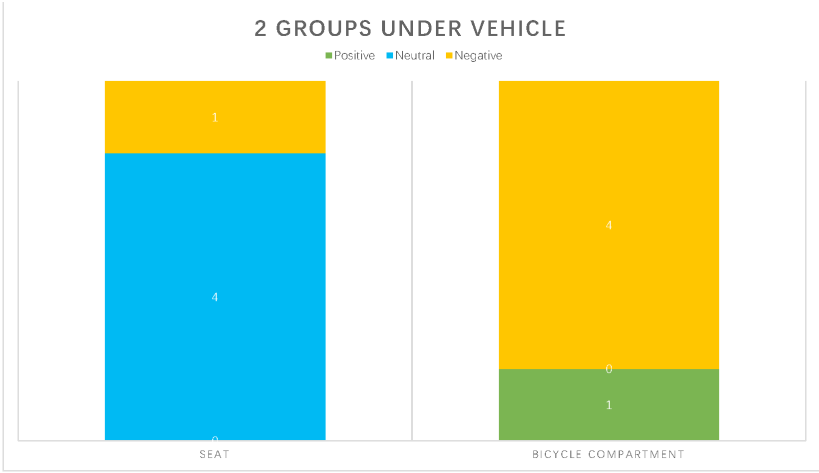
The shelter became an essential reliability-related feature when foreigners described their public transport experience in Helsinki. This feature does not appear on the topic of general reliable public transport experience. The main reason is that Helsinki’s winter weather is too bad that foreigners cannot tolerate prolonged exposure to severe cold conditions.

Graph.12 Colour Coded One Cluster under Station Cluster



Some participants combined bicycles and public transportation to move around the city of Helsinki. They are very grateful that metro and city trains provide a special carriage for bicycles. However, they mentioned that the number of bicycle carriage is limited, so when they wait for the metro or train, they do not know where the bicycle carriage would stop. Therefore, they have to wait for the vehicle stop and then look for the right carriage, sometimes the train just leave in front of them. Some passengers also explained that sometimes several bicycles park in the regular carriage, thus blocking the corridor. These factors can lead to unreliable public transport experiences.

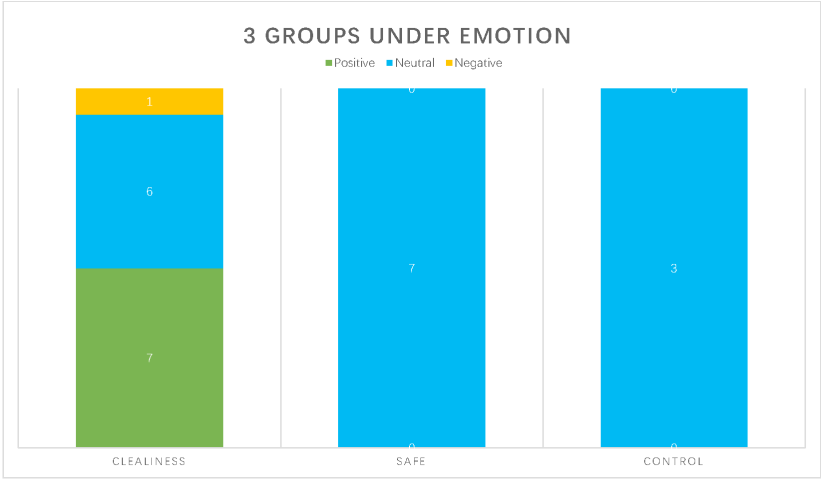
Graph.13 Colour Coded Two Groups under Vehicle Cluster



4.1.4 Emotion

The participants mentioned emotion category 6.0% of the time. The emotion category includes all the feelings linked to reliability. The participants mentioned the overall impression of cleanliness among the public transport system most of the time because it provides the feeling of security and reliability. The participants also perceived a feeling of security from the presence of a security appliance and patrol. The participants also described their reliability perception as a sense of control. They do not like “unexpected disturbance”. In general, in the emotion category refers to real feelings related to reliability. The cleanliness of public transport in the city pf Helsinki increase foreigners’ reliability.

Graph.14 Colour Coded Three Groups under Emotion Cluster



In this study, foreign passengers did not mention emotional related topics too much. Among them, most are related to the basic needs of using public transport, such as safety, control and so on. In my opinion, for a long time, most of the public transport authorities in the world only tried to meet the basic needs of pyramid of Maslow for public transport (Peek & Hagen, 2002; Maslow, 1943), so foreign passengers have no higher expectations for the public transport in the unfamiliar city (Greater Helsinki region). However, as

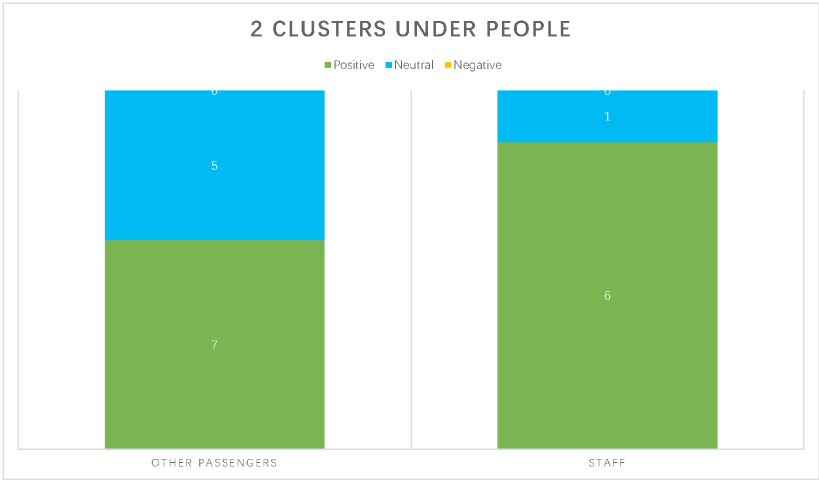
mentioned in the previous research background (section 1.1.3), nowadays, public transport user experience needs to be improved. Public transport services need to stimulate more positive emotions and bring meaningful public transport memories to passengers, so as to attract them to explore the city through public transport services. This provides ideas for the design concepts of this study.

4.1.5 People

The category of people is concerns both passengers and staff. The participants mentioned it 4.8% of the time.

The Graph. 15 shows that people in the public transport system help foreigners perceive reliability. First, because of the population, public transport in Helsinki is rarely crowded. Moreover, because staff are very professional, all foreign passengers can get their help when they need.

Graph.15 Colour Coded Two Cluster under People Category



The participants consider other passengers influence the matter of reliability most. The participants highlighted the importance of the distance between people. They do not want to be close to strangers. The idea of frequency and people flow have to do with how crowded space is. Other passengers' behaviours also significantly affect perceptions of reliability. Many participants identified they did not want to stay in a carriage with drunk people, which made them feel unsafe. The presence of staff increased the sense of reliability, especially when the participants need help. The participants concern the time the passengers appear: " I feel reliable when I met the staff in the dark night".

4.2 Emerging Trends of Ux Curves

The findings drawn from the analysis of UX curves will be discussed in this chapter. First of all, I will analyse the prevailing trend of most curves and interpret the meaning behind this trend. Then, the common reasons for the curves change are explained in the second section.

Table.8 Trends of Curve Types

Improving	Deteriorating	Stable
7	3	3

Table 8 shows the number of trends in UX curve types. Over half of the curves were improving, implying an improving public transport experience after HSL changed its service. Fig. 12 shows the UX curves with improving trends while Fig 13 shows the deteriorating and stable UX Curves. Except for one participant who just came for 4 days, all the curves show common trends. Curves stayed at a steady level after dramatic fluctuations. In the end, most of the curves are stable at a positive level. Many participants mentioned that “public transport in Helsinki is more reliable than public transport in their country, so the overall image is positive. Other participants explained that time changed their feelings on the public transport in Helsinki: “The longer you stay in Helsinki, the more you can feel the reliability of public transport.” In general, Helsinki’s general public transport services are perceived as more reliable than most other countries. Over time, most of the passengers are increasingly positive on the public transport experience in Helsinki. The quality of operational level is really reliable.

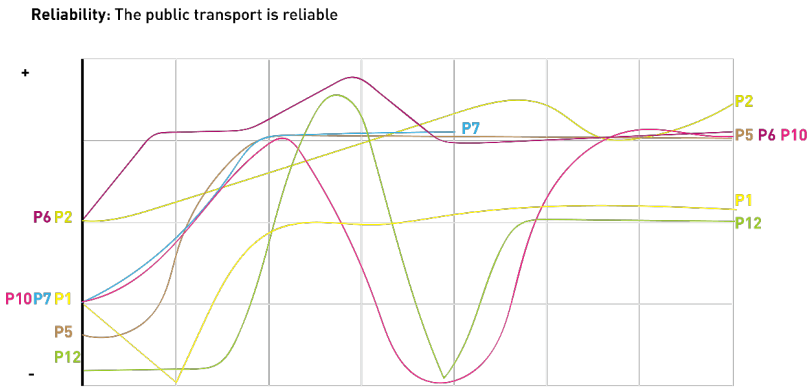


Fig.14 The Improving Cumulative Public Transport UX Curves with Participants IDs

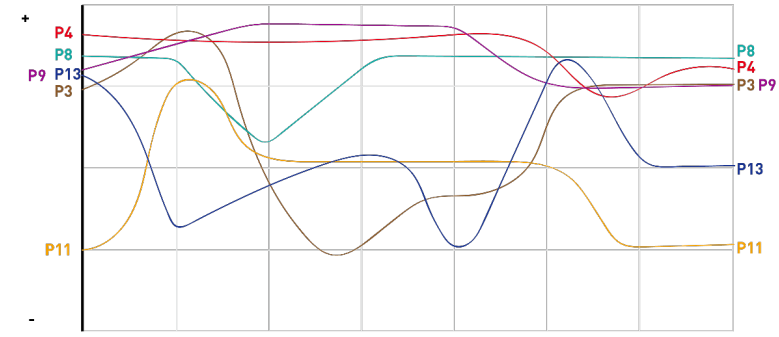


Fig.15 The Deteriorating and Stable Cumulative Public Transport UX Curves with Participant IDs

Although as mentioned above, participants affirmed the quality of general public transport service, Fig.13 and Fig.14 demonstrate that over half of the curves were initially at a relatively low level or had a distinct downward trend. This explains that the public transport experience is negative when the participants were in the face of service changes or just arrived in Helsinki. According to the reasons recorded by the participants, two main reasons were found. First of all, when they are facing new services, they need to

spend a lot of energy to learn about new public transport information. This information mainly includes the zone division of the public transport system and buying tickets, which is too cumbersome for them to digest. Some participants expressed that they did not know from which channel to know the information, which made them very nervous when using public transport when they were unfamiliar with the new system. Some participants stuck in trouble during this period of time, which resulted in the loss of time or money. One participant said that she had bought the wrong ticket because she did not know the new zone division. This incident directly led to her hesitation to use public transport for some time afterwards. It is precisely because these accidents prevent them from perceiving reliability.

A learning process is needed when people are facing new public transport services. The lack of knowledge about local transportation leads to an unreliable public transport experience. Participants responded that the learning phase lasted for 1-3 weeks. This time period is too long for most foreign tourists because most of them do not stay in Helsinki for so long. In this way, foreign tourists who visit Helsinki for a short time are likely to leave with the impression that Helsinki's public transport service is unreliable, which cause negative impacts on the city overall image.

From the concept of reliability, participants need input to help them form an overall expectation of public transport so that they can confidently act as expected. However, in the first stage of using public transport in Helsinki, there were two hinders prevent input away. First, foreign passengers are lack of input sources. They do not know where to get authoritative information about Helsinki public transport. Second, some information is too complicated, which is difficult for them to internalize as input that they can rely on. These disturbances make it impossible for these foreign passengers to anticipate how the public transport system in Helsinki will be used. Thus, they will have an unreliable feeling. When they have to face an unfamiliar public transport system, they will make use of their public transport "knowledge" in other regions. However, if these experiences are quite different from those in Helsinki, they may waste a lot of money and time when using public transport. These losses will increase their sense of unreliability. For example, several Asian tourists shared their public transport experience in Helsinki. When they first came to Helsinki, they did not know to wave hand to stop the bus until waited in the bus stop for half an hour, the passengers realized something went wrong, but they still did not know what

to do. Some passengers who did not figure out the reason gave up using the bus for a period of time.

General public transport rules may become complicated in Helsinki in future because the public transport modes are becoming diversified. Many foreign participants admired the connection between different public transport modes in the Greater Helsinki region. Diversification of public transport will help to expand the new tourism economy. Many foreign participants expressed their desire to use city bicycles and electric scooters in Helsinki, but they gave up because they did not know how to use them and were afraid of violating traffic rules. More different modes of transport mean more general rules of public transport to be learned. Sometimes for local residents, when using new modes of transport, they also need to learn the corresponding traffic rules. As Helsinki is increasingly diversified public transport, these general rules delivery may need to be geared to all passengers.

In short, foreign participants are satisfied with the public transport system. One of the biggest challenges for the public transport sector in Helsinki is how to enable foreign tourists to quickly learn how to use high-quality public transport systems, in other words, how to shorten the initial learning process.

This finding can be proved by the colour coding as well. This reflects data triangulation. Graph. 1-15 shows how different features impact the reliability of public transport in Helsinki. Among the five categories affecting public transport reliability, 210 quotes refer to the impact of communication on the reliability of public transport experience while 81 quotes refer to the impact of the public transport system itself. And negative quotes on the system (18) is significantly less than communication (124). As Graph.8 shows, foreign passengers are satisfied with the frequency, connectivity and accessibility of Helsinki's public transport system. To sum up, participants satisfied the quality of public transport service in Helsinki, but they did not think that these good qualities were conveyed to them well at the beginning.

4.3 Visualizing Two Scales of The Travel Journey

In this chapter, the outcome of colour coding was demonstrated through two scales of the customer journey map. Although the two journey maps illustrate the two specific journeys of two specific personas, they are research-based. Some contents of journey maps also come from UX curves and statistic coding. The outcome shows passengers' satisfaction among the public transport service in the Greater Helsinki Region.

4.3.1 First Journey

Fig.15 shows the first journey of Japanese tourists who will travel from airport to hotel. Then I will conclude the findings among clusters or features.

Navigation

80% of navigation-related features mentioned the negative impact of unclear navigation on the reliability of public transport system in the city of Helsinki. Among them, participants are most dissatisfied with the guidance and instructions for metro exits, each with seventeen negative quotes. Participants pointed out that weak guidance decreases the connection of public transport, especially when they are not familiar with the city. Sometimes they have to spend extra time to find a way a stop so they always take more time than the APP advised. The participants also mentioned that they always hesitate to choose metro station exits. They do not know which exit is closest to their destination. There is no such information source. Participants admired the metro signs while they are not satisfied with the bus stops. Some participants mentioned that they always took the wrong direction when they just came to Helsinki. Passengers also emphasized the importance of knowing their real-time location, and they would like to have some signs inside the Vehicle to indicate where they are.

First journey from airport to hotel

Step

Find station

Access to internet and navigate to the hotel.

Easy to follow the guidance in the airport.

Buy ticket

She didn't know which ticket is the right one, because don't understand zone division and route map

Staff help buy a ticket.

It is not convenient to keep a piece of paper (ticket).

Wait for train

The screen counts down the arrival time.

The train didn't arrive as the google maps showed.

She realized there was disruption.

On boarding

Enough space for the luggage.

She was afraid of missing the stop, so she have to check the screen and google map all the time.

Transfer

Didn't know where to take a bus, because of weak transfer signs.

Staff helped.

Wait for bus

Two buses left directly and she didn't know why.

She has waited for a long time outside and it is too cold.

Local passenger tell her she need to wave hand to stop the bus.

Get on a bus

Finally get on the bus but the ticket is overdue and she has to purchase

Pay all attention to the stop reort.

Walk to destination

Channel

Explain

Navigation

- 80% of navigation-related features mentioned the negative impact of unclear navigation on the reliability perception.
- Among them, participants are most dissatisfied with the guidance and instructions for metro exits.
- Participants admired the metro signs while they are not satisfied with the bus stops.
- Passengers also emphasized the importance of knowing their real-time location.

Received information

- 63.2% of the disruption quotes considered that HSL did not deal well with disruption information.
- A disruption will make passengers think that public transport is unreliable, even though public transport is usually very punctual in Helsinki.
- Most participants feel stressed out when they took public transport because they have to pay all their attention on the bus reminder. (23 out of 28 quotes)

General rules

- General rules are taken for granted by local citizens but foreign residents are not familiar with them. Sometimes passengers have to spend extra time and money than they expected because they are not familiar with these rules.
- The public transport rules are especially new for passengers outside Europe. In addition, some traffic rules should be delivered to foreigners as well, because Helsinki is increasing public transport modes.
- Foreign tourist met many obstacles when they purchase tickets. They do not understand the zone division and how to choose a right one; they are confused about the difference of price on diverse channels; they consider the information on the ticket machine is useless.

Information sources

- For foreigners, they can get above information from internet and staff. The help from staff always helps foreign tourists regain a sense of reliability.

Opportunity

Navigation

- Easy-to-read navigation is especially important for transport hubs, like city center and Pasila.
- There are many exits or transfer routes inside buildings. Exits signs could be improved. Reading navigation in some transfer hubs buildings is tough for the new comer. Designing clear navigation could shorten the detour time.
- A map of exits can be displayed in the transport hubs. For the navigation, the floor can be used. A HSL application could be designed as an useful utility that provide guidance information.

HSL Application (New functions)

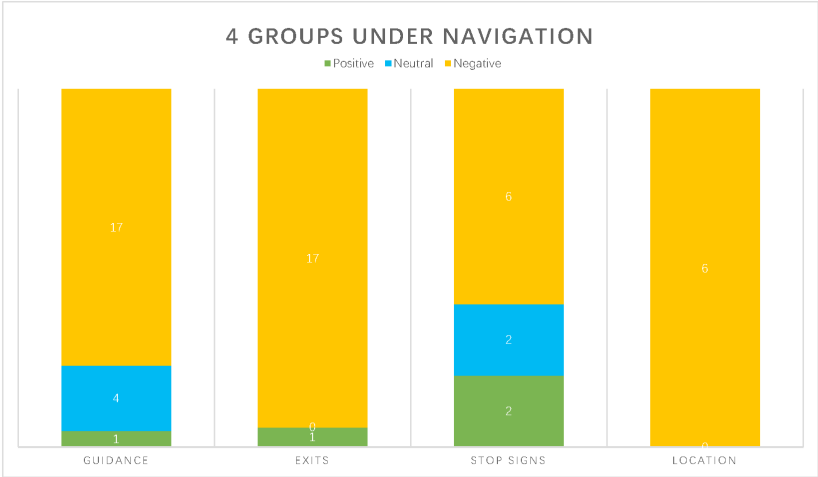
- HSL application make public transport journey in Helsinki easier when it integtates different functions. For example it is convenient to purchase ticket and plan the journeyin the same application.
- When people get used to plan journey by HSL app, disruption notice can be pushed through this channel, Also, stop reminder could remind passengers through Application.
- For residents, increasing user stickiness is crucial. People don't use HSL app much because the similarity with google map. Foreign passengers should know about HSL application before they came to Finland.

Communication in advance (Content)

- As mentioned before. The lack of significant inputs are missing. Some are not communicated in time, some are neglected. The general rule can be delivered to passengers in advance
- Ticketing system don't need to be learnt if passengers using HSL application, so the existence of HSL application can be told to foreign passengers in advance.

Fig. 16 Customer journey map: First journey from airport to hotel (Stickdorn, 2018)

Graph.16 Colour Coded Four Groups under Navigation Cluster



Received Information

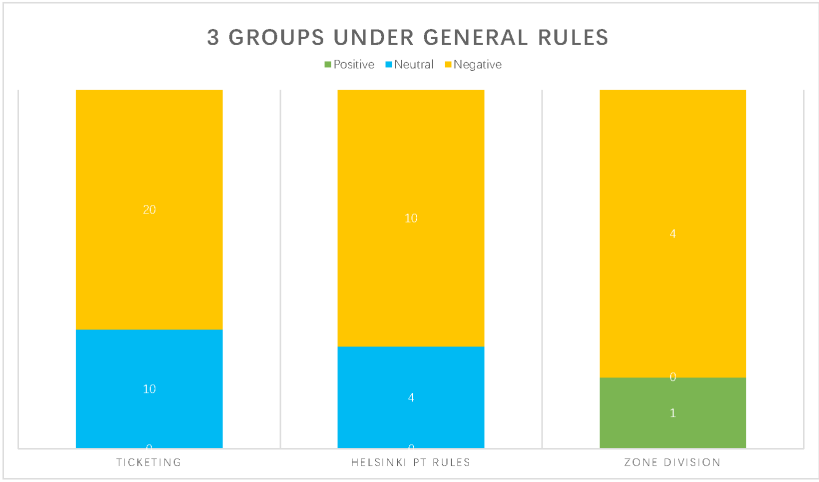
As Graph. 16 Shows, participants believe that Helsinki's public transport system is always very punctual as application and scree showed, which is one of the most important factors to bring them a sense of reliability. But when they encountered disruption, their situation was always terrible, because they did not know disruption happened, so they often wait at the station with growing perplexity for a long time. 63.2% of the disruption quotes considered that HSL did not deal well with disruption information. Some participants met uninformed disruption in severely cold winter, and they had serious illness in the end. This exacerbates the unreliable perception. Overall, a disruption will make passengers think that public transport is unreliable, even in Helsinki, public transport is usually very punctual.

Most participants feel stressed out when they took public transport because they should pay all their attention to the bus reminder. (23 out of 28 quotes) As they do not understand the bilingual report, they have to compare the GPS on guide application and the report screen all the time in case they miss the right stop, which makes them stressful. They want an easy way that informs them when they should get off.

General Rules

General rules are taken for granted by local citizens, but foreign residents are not familiar with them. Sometimes passengers have to spend extra time and money than they expected because they are no familiar with these rules. Foreign tourist met many obstacles when they purchase tickets. They do not understand the zone division and how to choose the right one; they are confused about the difference in price on diverse channels; they consider the map on the ticket machine is useless. From the observation, I found that foreigners always spend almost five times as long as citizens on purchasing tickets.

Graph.17 Colour Coded Three Groups under General Rules Cluster

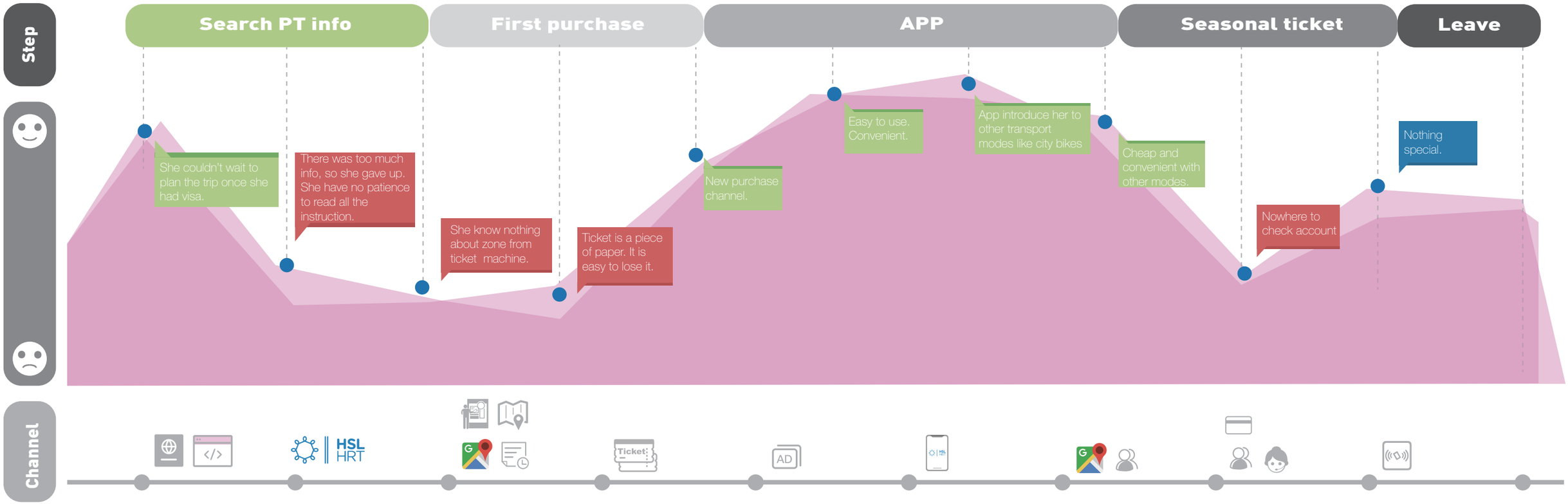


The public transport rules are also new for tourists outside Europe, as mentioned before, many Asian passengers do not know they need to wave a hand to stop the bus. Some traffic rules should be delivered to foreigners as well because Helsinki is increasing public transport modes, foreigners can travel around the city by bikes and scooters. If they are not familiar with local traffic rules, some accidents may occur.

Information Sources

For foreigners, they can get above information from Internet and staff. The help from the staff always helps foreign tourists regain a sense of reliability. Internet access is not always smooth for some foreign passengers.

The journey of awareness of HSL



Channel

Learning motivation

- When participants knew they would go to a new country, they are willing to researching about local public transport. As, for most foreign passengers, public transport is the most easy and cheap way to travel.
- Their learning motivations are very high at first stage. However the motivation decreased dramatically as they were not able to find accurate information about the public transport service in the Helsinki. The lack of information channel causes the sense of unreliability.
- Many participants said that they would learn about a new country's public transport system through some travel logs, but the resource of other travelers' experience are not always accurate, which would make them feel unreliable.

HSL application

- After passengers started using HSL applications, they gain a greater sense of reliability in public transport. Because application integrates many functions, they don't neet to remember different rules.
- However, many participants indicated that they did not start using HSL application from the very beginning. Some people said they did not know about HSL application at first. Others said they did not know about its versatility and did not recognize the difference between HSL application and Google map.
- The more foreign residents use HSL applications, the more reliability and convenience they will perceive from public transport.
- However, foreign residents who use personal cards think the connection between HSL application and their seasonal services is weak.
- Enhancing user stickiness for these groups with personal cards is also challenge.

Opportunity

Communication in advance (Channel)

- I think HSL can start to get in touch with foreigners when they know they will come to Finland. Some ads can be put in embassy. Travel tips can be introduced to foreigners. Airplane is also a good channel for foreigners knowing PT in advance.
- Collaboration with tourism organization may be a good solution. For many foreigners, travel logs is the first channel through which they know PT in Helsinki and their motivation of learning is strongest at first. HSL can be introduced as good helper for special activities like hiking, cycling. It would be attractive for both foreigners and locals.

HSL Application (Timing)

- Foreigners should be told they can get these benefits from HSL application. Thus, the differentiated functions of HSL application need to be highlighted in advertisements.
- After foreign passengers return home, HSL should exist in their memory in a more meaningful form. In this way, they can introduce HSL to more foreign passengers through their oral propaganda.

Fig. 17 Customer journey map: The journey of awareness of HSL (Stickdorn, 2018)

4.3.2 Awareness of HSL

Previous research results have shown that weak communication between HSL and foreign passengers is the leading cause of perceiving unreliability. Thus, Fig. 17 shows the awareness journey of HSL by a foreign student. This chapter will use the findings of colour coding to explain some of the significant phenomena in this user journey map.

Learning Motivation

When people know they will go to a new country, they are willing to researching on the local public transport, because for most foreign passengers, public transport is the easiest and cheap way to travel. It is interesting to note that their learning motivations are very high at the first stage but then decreased dramatically as they are not able to find accurate information about the public transport service in the Greater Helsinki region. The lack of information channel causes a sense of unreliability. Interestingly, many participants said that they would learn about a new country's public transport system through some travel logs, but other travellers' experience would always be different from reality, which would make them feel unreliable.

HSL Application

When passengers start using HSL applications, they gain a greater sense of reliability in public transport. Because application integrates many functions, for example, they can buy tickets directly after querying zone divisions, so passengers do not have to spend too much energy considering which tickets they need to buy.

However, many participants indicated that they did not start using the HSL application from the very beginning. Some people said they did not know about HSL application at first. Others said they did not know about its versatility and did not recognize the difference between HSL application and Google map. Even in interviews, many participants who stayed in Helsinki for more than a year mentioned they did not know HSL application has

such rich functions. Another factor that prevents people from using HSL applications is the uncertainty of the Internet access. As a result, foreign passengers dare not totally dependent on mobile applications. However, among all the participants, two Chinese students mentioned an interesting phenomenon. When they first came to Helsinki, they knew to buy tickets with HSL application, because their predecessors provided a very detailed survival guide in Helsinki, which included information on the use of public transport. Therefore, they knew that using HSL application is a time-and-labour-saving operation, but most participants did not know about it at very first. For most ordinary travelers, lack of information channels is still the main Challenge.

There is also a notable trend in this customer journey map. The more foreign residents use HSL applications, the more reliability and convenience they will perceive from public transport. However, as some groups who use personal cards and make a seasonal ticket through it, the connection between HSL application and them weakens. Then, Google Map gradually replaces the HSL application. Some student participants told me that this is because most of the functions they can use could be implemented through Google Map if they do not need to buy tickets through HSL application. Also, they collect many places on Google Map. When they want to go to these places, it is more convenient to navigate through Google Map. As a result, over time, they gave up using HSL application. Enhancing user stickiness for these groups with personal cards is also a challenge.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Otnäsvägen Ut Exit

INTRODUCTION
LITERATURE REVIEW
RESEARCH FOR DESIGN
RESULTS
DESIGN CONCEPT
DISCUSSION &
CONCLUSION

5

5. Design Concept

In this chapter, the design strategy targeting reliable public transport experience was suggested according to the above findings. Then some solutions were presented to two staffs in customer experience and sale department of HSL. The two staffs, as experts, provided me with feedback. According to the feedbacks, I refined the solutions.

5.1 Strategy for Reliable Travel Experience

In this section, I will propose a design strategy targeting reliable public transport which is achieved through the implementation of a combination of different levers. The strategy map in this research project refers to a map utilized by Arthur D. Little. In the map, Little (2018) showed transport-related customer experience improvement levers through improving core transport offering to reduce dissatisfaction, providing value-added services and strengthening customer loyalty. Public transport services in Greater Helsinki region will be designed through these three kinds of levers in this study. The design concept is presented in the sequence of the customer journey. Based on the strategy map, communication strategy, improved digital service and additional services are combined to improve public transport experience for foreign passengers.

As mentioned before, the complex public transport system involves a variety of service providers and passengers. Although this research project targets on improving public transport experience for foreigners, the superior user experience is achieved through a combination of different levers (Little, 2018). The three directions in the strategy map are interrelated and mutually reinforcing in the public transport system.

Based on the opportunities summarized in the customer journey map and previous research results, three design directions are suggested. First, it is necessary to establish closer customer relation with foreign passengers before they came to Helsinki through pre-communication. In this way,

Foreign Passengers Experience Levers

Pre-service: Communication in Advance

Channel

Tourism website:

Embassy

Aircraft

HSL

Content

Differentiated Value

-Integrated functions
-Integrated information
-Personalization

General Transportation Rules

-Stop buses
-Ticket validation
-Get off bell
-Riding etiquette
-Traffic rules

Usage: Integrated Digital Solution

HSL application: Multisensory interaction Information integration

Emphasize Service Integration Benefits
The favorite places, planning itinerary, buying tickets, reminding to get off, and information reminding are all integrated into one application.

Enter traveler page

Tips for travelers
Since foreign passengers and local passengers share the same application, a button can be designed to guide foreign passengers to a page that introduce general rules in greater Helsinki region.

Collect Favourite Locations
Whatever the purpose of foreigners coming to Helsinki, they want to explore the city. The function of the collect favourite location helps them complete their journey of exploration.

Arrive Helsinki

Plan Itinerary
Passengers can navigate directly from their collection sites, reducing cross-plat-form operations and enhancing the ease of use of APP.

Purchase Directly
Passengers can buy tickets directly after plan the itinerary and the planned route will be recorded with the ticket. Passengers may modify it in the middle

Personal Disruption Info
If foreign passengers plan their itinerary through HSL application, the information of disruption can be sent directly to their mobile phones, so they won't miss it.

Download

Get off Reminder
The stops reminder can be connected with the ticket system in the application. Application reminds passengers to get off through multi sensory interaction. This will also prevent foreign passengers from understanding complex cross regional systems.

Highlight Exits and Platforms Number
Public transport system has set up signs for passengers to quickly find the station and exit. This information can be highlighted in the navigation, so that foreign passengers can quickly find stations, exits, etc.

Next Journey...

After-service Explore the City with HSL

Travel content support

Wonderful Places Collection

Collect Favourite Places

Plan and Collect Journey

While browsing about Helsinki, foreign passengers can be guided to HSL's platform to collect their favorite places. Also, they can plan their exploratory journey in the HSL application.

Explortary Activities

Bicycle

Scooter

In recent years, more public transport modes appear, especially in Greater Helsinki region. These means of transportation can be well integrated with the activities of exploring the city. This kind of integrated service can bring positive emotions to foreign passengers.

Navigation support

Exits and Platforms

It's easy for foreign tourists to find exit and station quickly. In Helsinki, every station and exit has corresponding numbers ot letters which could be highlighted in the navigation information to help foreign passengers to find the right way.

Indoor Navigation

Navigation systems in buildings are so complex that tourists sometimes miss their way inside and sometimes they don't understand them. HSL APP can provide additional hints to help them.

Pre-Communication ▶ Closer Customer Relations

Extend

HSL

HSL Application

Public Transport Service in Greater Helsinki Region

Foreign Passengers who have strong thirst for the knowledge of PT in Helsinki

Rules

Foundation

Well-implemented Core Services ▶ Reduce Negative Emotions

Intro

Intro Page of HSL application

Planning Itinerray

Indoor and Outdoor Navigation

Tcket Purchase

Stop Reminder

Information Notification

Introduction is the core service for newcomers.

Mobile application plays an important role in every basic public transport service, avoiding the interference of uncontrollable factors. Different core services are interconnected, so foreign passengers can get a consistent, personalized and reliable public transport experience.

Foundation

Value-added Services ▶ Increase Positive Emotions

Public transport services as tool

Helsinki

Public transport service as part of city exploration

Helsinki

Fig. 18 Foreign passenger public transport UX improvement levers (Little, 2018)

foreign passengers can not only use HSL application in advance but also learn some general rules about Helsinki transportation. Also, Integrated digital solutions provide core services, such as ticket buying, station reporting, fault information notification, etc., Those are service stages where foreign passengers encounter difficulties through traditional facilities or information channels. Furthermore, additional public transport services, which are highly integrated with other activities, can create value for foreign passengers who explore the city, thus bringing more positive emotions.

5.1.1 Customer Relations: Communication in Advance

The public transport authority could establish closer customer relations through pre-communication. HSL could improve communication by increasing marketing channels and adding communication contents before foreign passengers come to Finland. So, they could understand how public transport services work in Helsinki in advance. The information can help foreign passengers to build up the right psychological expectations. Also, they could realize that HSL application is a very convenient tool. This lays the foundation for the improvement of mobile application user experience. Moreover, through new contents, hopefully, they can understand the special rules of public transport in Helsinki in advance. In this stage, public transport authority could lay the foundation for better implementation of core services.

Channel

I consider public transport authorities could get in touch with foreign passengers in advance through embassies, aircraft and tourism websites.

- Embassy

At the embassy, foreign tourists know that they will be able to come to Helsinki soon. At this time, they have an intense thirst for knowledge about Helsinki, including public transport. If they have relevant marketing materials in the embassy, they will more likely read them carefully.

- Aircraft

Because tourists do not have much to do on the aircraft, many people will read magazines and videos to learn about the customs of Helsinki. This is an excellent time to introduce Helsinki’s unique public transport rules.

- Tourism Website

As most participants mentioned before, many foreigners learn about local public transport through some travel logs, while some tourism websites also give official travel strategies, such as TripAdvisor, Guide to Finland, etc. If there are links in these articles to attract tourists to official websites, they can get important information about Helsinki traffic.

Content

The highlighted differentiated value and general rules could be delivered to foreign passengers before they came to Helsinki.

- Differentiated Value of HSL Application

The research results show that foreign passengers have difficulties in using the facilities in the public transport system due to many force majeure factors. HSL application's integrated digital services can help them solve these problems, which is an attractive feature for them. Furthermore, when foreign passengers use public transport services, there will be many sources of information. Through HSL application, foreign passengers can get targeted information, so as to make adjustments for any possible disruptions. Moreover, the information could be delivered according to personal situations. In general, HSL allocation is a platform of integration of functions and information, which is the most critical differentiated value that should be delivered to foreign passengers.

- General Transportation Rules

It is necessary to inform foreign passengers of general knowledge in advance. Although HSL's website has tips for visitors, the pages are hidden at a deficient level. Moreover, the relevant content is in the form of text, which is too dull and lengthy for readers. Expressing these contents in other forms like vivid pictures or videos may improve the readability of the content. According to the problems found by foreign passengers in this study, the rules include: wave to stop, ring the bell to get off, ticket validation, traffic rules, etc.

5.1.2 Core Services: Integrated Digital Solution

As mentioned in Section four, due to language barriers and cultural differences, sometimes, it is difficult for foreign passengers to use public transport facilities and obtain public transport information. An integrated digital platform can be designed to provide passengers with core public transport services, including planning itinerary, indoor and outdoor navigation, ticket purchase, stop reminder and information notification. Some of these core services are now implemented in HSL application. But HSL application can only provide reliable public transport experience for foreign passengers if all the core services mentioned above are linked to each other. In addition, the introduction of the whole public transport service is also the core service that the urban public transport authority should provide to foreign passengers. The mobile application plays an important role in every basic public transport service, avoiding the interference of uncontrollable factors. Different core services are interconnected, so foreign passengers can get a consistent, personalized and reliable public transport experience. Only when core services are implemented well, can passengers not have negative emotions.

Introduction

Although the introduction page of the HSL application summarizes the basic functions, the service integration advantages of HSL are not reflected. It is difficult for users to realize the difference between HSL APP and Google Map, so most of them still choose to use Google Map. In addition to showing the features of integration, some simplified processes can be shown on the introduction page. For example, using an application is the simplest way to buy tickets. They don't need to learn complex ticketing and zoning systems.

A button that can access to general rules could be designed for foreigners on the introduction page. Although there are pages on the website that introduce these contents now, the hierarchy is hidden. In addition, there is no access link in the application. With a link button, foreign passengers could smoothly go to the page and learn these rules conveniently, so that they will not feel unreliable due to some unique public transport use process in Greater Helsinki region.

Integrated Services

The current HSL application has integrated planning itinerary and ticket purchase function, but it can cover more core services. For example, it can remind foreign passengers to transfer, get off, and navigate through multi-sensory interaction methods such as vibration and sound. Use the information of journey planning and

tickets purchase to intelligently remind passengers to transfer, get off the bus and push out fault information. These designs can improve the reliability of foreign passengers without making significant adjustments to existing public transport facilities, thereby improving foreign passengers' public transport experience in a relatively simple way. Improving these core services levels will ensure that passengers do not develop negative emotions.

5.1.3 Value-added Services

For foreign passengers, whatever their purpose of coming to Helsinki, most of them are curious to explore the city. Public transport service used to be regarded as a tool to explore the city, but in recent years, Helsinki's public transport service has become an important public service representing the image of the city of Helsinki. The experience of Helsinki's different modes of public transport has gradually become an emerging activity for foreign passengers. As mentioned in Section 4, many foreign passengers are willing to try new public transport modes, such as Whim, shared scooter and so on. I think the urban public transport authority can cooperate with tourism agencies to design interesting exploratory routes with different public transport modes. It is important to provide foreign passengers with methods and rules to use the new public transport mode. These value-added services help to improve the satisfaction of foreign passengers and leave them meaningful memories about urban public transport in Greater Helsinki region.

Travel content

If HSL application participates in the journey planning period, it can not only help users to plan the journey conveniently but also establish a relationship with users in advance. Diversified tourism-related functions can increase attractiveness. While browsing about Helsinki, foreign passengers can be guided to HSL's platform to collect their favorite places. Also, they can plan their exploratory journey in the HSL application. These functions will not affect local passengers, but also bring convenience to them.

- Destination Collection

When describing exciting tourist attractions, tourist articles can guide foreign tourists to HSL application to collect these sites, so that foreign tourists can rely on HSL application for navigation in Helsinki, rather than switching back and forth in several navigation applications. They can also plan and collect routes to explore the city in

advance according to their own conditions.

- Plan and Collect Journey

In recent years, more public transport modes appear, especially in Greater Helsinki region. With an open mind, the public transport sector has introduced many different means of transport to Greater Helsinki region. The study found that foreign passengers are also eager to try these new travel modes. Furthermore, these means of transportation can be well integrated with the activities of exploring the city. This kind of integrated service can bring positive emotions to foreign passengers.

Navigation

The navigation system of public transport is mainly divided into two categories: the indicator of exits and platform, and the navigation system in buildings.

- Exits and Platforms

It's easy for foreign tourists to find exit and station quickly. In Helsinki, every station and exit have corresponding numbers of letters which could be highlighted in the navigation information to help foreign passengers to find the right way.

- Indoor Navigation

Navigation systems in buildings are so complex that tourists sometimes miss them and sometimes they do not understand them. I think HSL could enlarge the logo and text a little. HSL application can also provide additional hints.

5.2 Concept Validation with The Experts

I presented the above research findings and solutions to the staffs who work in customer experience and sale department of HSL. After the presentation, a focus group was conducted. The objectives of the meeting were to get some feedback from public transport experts. Based on feedback, I refined the design solutions. These experts' opinions patched my lack of knowledge that viewing public transport from the operators' perspective.

The whole meeting was held in HSL premises lasting approximately 1 hour. First, I briefly introduced my research topic and research process and then I mainly presented the findings and design concepts for half an hour. I described three design directions and how they interact with each other. Then we discussed together with the concept implementation. The whole discussion was documented and recorded. The data is presented anonymously due to research ethics. After learning about the restrictions of public transport implementation in the Greater Helsinki region and some HSL development plans, I consider a specific cross-platform tourism product could be provided to foreign passengers.

The staffs expressed their interests on foreigners as the target group. As mentioned before, the Greater Helsinki region is planning to be an international hub that connects Asia and Europe. They agreed that public transport experience improvement for foreigners is significant. Also, they were planning the contactless payment card payment system for those who do not want to learn the public transport system. Foreigners who first came to Helsinki were such a group. Thus, they are interested in their public transport experience. Also, they realized the growing population of residents who speak a foreign language, so it is excellent to know the research findings.

The staffs thought the findings that indicate foreigners do not know about public transport general rules is interesting (waving hands to stop the bus, searching a bus stop by the corresponding number and so on.), because Finnish people take those actions for given and they never considered it could be a problem. We discussed that it would be great to have some pages to show this kind of instructions and demonstrate the difference between HSL's competitors. However, I found there has been an instruction page on the HSL website, which shows how to use HSL services. The staffs don not know that as well as the participants in this study. In addition, there is no such access in the HSL application. Therefore, it can be concluded that the introduction of the general rules about public transport services to foreign passengers has not been taken seriously. In my opinion, the level of access to the introduction page for foreign passengers can be designed to be easier to access. Also, this page should be easily searched by search engines. In addition, the direct link needs to be designed on the application.

The same situation happened to many other HSL services, such as ticket purchase in HSL application. HSL has designed service to enhance public transport experience, but the passengers do not know that. Some research findings corroborate their previous studies, and they had already had solutions. but many solutions do not reach the passengers. They agreed it is the issue of communication.

In summary, the communication between HSL and passenger need to improve in two aspects. First, HSL should teach passenger to use the newly designed service. Otherwise, these user-centric designed services will hardly be discovered by passengers. Second, I understood the information hierarchy of the HSL online platform would not be apparent if one platform serves both foreign tourists and local passenger. Therefore, some functions of HSL are hidden, and users need to explore them. In the future, I think HSL can develop derivatives to create value for different users, especially for personal mobile ends.

The work of beforehand communication refers to marketing. The staff reflected that expanding new channels of communication with foreign tourists in the early stages may involve high advertising costs. For instance, Finnair would charge HSL a lot if HSL launch brochures or advertising videos on flights and they could hardly afford. However, it is possible to publicize HSL service in advance with tourism organizations. HSL have already work with them offline in the airport, but the travel agent is difficult to find in the airport. I think it is a suitable time to expand collaboration with online materials. Because for most foreign tourists, some travel logs are the first channel to know HSL public transport service. Their learning motivations are high in that stage; thus, it is the right time to deliver some instruction information. And If they want to finish their travel plan when they are in Helsinki afterwards, reliable public transport service is essential. Tourism companies want to provide credible public transport information to tourists, and HSL need a channel to reach foreigners before they come to Finland. The information flow exists between the HSL and tourism organizations.

Overall, tourism organizations are stakeholders that can be developed in-depth in the future. HSL and tourism organizations can not only enhance information interaction online but also create new tourism routes using different modes of public transport in the future.

INTRODUCTION
LITERATURE REVIEW
RESEARCH FOR DESIGN
RESULTS
DESIGN CONCEPT
DISCUSSION & CONCLUSION

6

6. Discussion & Conclusion

This chapter will discuss the research results by answering three sub research questions that are determined at the beginning of this thesis. Then the benefits of the three findings will be discussed, along with some possible limitations. Next, some recommendations for further study directions will be given. The thesis will end with a self-reflection on the whole research.

6.1 Discussion

The research outcomes of this thesis could help to answer the three research sub-questions:

What influence perception of reliability when non-locals using public transport in an unfamiliar city?

The results demonstrate that communication, system, environment, emotion and people in the public transport system are relevant to the perception of reliability in public transport service. This is consistent with the conclusion of Fujii and Kitamura (2003) that passengers' public transport experience is influenced by both transport service level and psychological factors. Psychological factors involve the following two aspects: information communication with public transport service helps passengers build expectation on the public transport system and the public transport environment transmit emotional signals to passengers. For example, early communication gives foreign passengers a general understanding of the use of public transport in an unfamiliar country. For environmental signals, foreign passengers often refer to the clean and tidy public transportation environment that makes them feel reliable and safe when they are in a foreign country. The service level of public transport refers to the operation of the public transport system, public transport facilities and staff's assistance.

For foreign passengers, psychological factors have a more significant impact on reliability perception than for the local. If the public transport service does not

meet the expectations of non-locals, they will misunderstand the public transport service and perceive the service unreliable, even though the public transport system is operated well. Similarly, Le (2014) concluded foreign passengers would not be attracted by excellent the public transport system if they do not know about it. The help of the staff can only remedy the horrible situation but cannot actively create reliable public transport experience. Therefore, it is vital to help foreign passengers establish reasonable expectations through communication and environmental factors.

What can be improved in the current public transport service in the Greater Helsinki region?

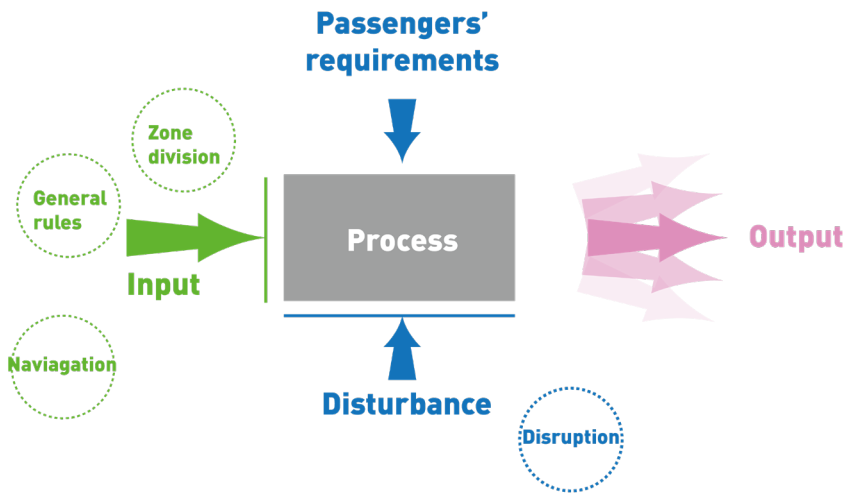

Fig.19 Cause of Unreliable Feeling (Heylighen and Joslyn, 2001; Oort, 2011)

As summarized in section 2.3.2above, based on the theory of cybernetics (Heylighen and Joslyn, 201; Oort, 2011) passengers perceive the sense of reliability depending on how well expectations (based on input) match the actual operation of public transport service (output). As Fujii and Kitamura (2003) concluded, passengers' travel experience is affected by both public transport service level and psychological factors. The public transport service level and the performance of staff is proved to be at the relative right level in Greater Helsinki region according to the feedback from participants. Public transport reliability perception of foreigners is mainly influenced by psychological factors. Psychological elements refer to establish a

reasonable expectation on the public transport service. This is comparable to previous results of relationship between expectation and customer satisfaction (Lai & Chen, 2011). Some general rules of local traffic, ticketing system can be told beforehand to establish reasonable expectation. Otherwise foreign passengers may utilize their previous experience and perception to make expectation which may deviate too much from actual public transport service output. However, some input may be difficult to digest, so it is crucial to simplify the learning process. For example, appropriate marketing strategies should be utilized to reach foreign passengers (Trinh, Le, & Wien identified, 2014). This study suggests that in order to create reliable public transport experience for foreign passengers, the timing and channel of marketing should be improved.

In addition, the inability to obtain disturbance information in the public transport system can also lead to unreasonable expectations. This is because of the insensitivity to information delivered in an unfamiliar language. The bilingual system adopted by the Helsinki public transport system makes it especially difficult for newcomers to understand. Therefore, in the public transport system, multi-sensory interaction could be used to increase the sensitivity to the information transmitted by public transport system.

Overall, the reliable public transport experience of foreigners in the Greater Helsinki region can be summarized as:

The clear and understandable communication inputs and disturbance information are given to help foreigners form reasonable expectations on the public transport service outputs.

How can service design approaches help in improving reliable public transport experience for non-locals?

It is crucial to utilize user-centric service design approaches to improve user experience of non-locals. User-centric service design approaches help to identify user needs and motivations and evaluate user experience, which helps designers with different cultural backgrounds to build empathy with non-locals. This study reported a case study of how user-centric approaches could be utilized to improve public transport experience for non-locals. User-centric design approaches help to establish first-hand knowledge of why, how and where non-locals interact with public transport service. Then these user insights could be brought forward to optimize the public transport user experience for non-locals.

As a mindset, service design helps to consider public transport experience improvement from a global perspective. Public transport service is public service with diverse passengers. This study aims to improve public transport experience for non-locals in the Greater Helsinki region. Service design mindset helped me to take into account the experiences of the local people throughout the design process. In this study, I focused on foreign residents, who have the characteristic of both locals and non-locals, as research objects. In this way, I consider the public transport service from a comprehensive perspective. However, further researches are required to investigate the first-hand travel behaviour of foreign passengers with broader backgrounds.

Visualization tools for service design simplify cross-background communication in public transport experience improvement. Public transport is a complex system involving various stakeholders, including public transport organizers from different departments, passengers from diverse backgrounds, public transport operator, and so on. Efficient communication among these stakeholders can help to apply user insights to public transport experience design. In this study, these visualization tools are applied to the communication with research participants and experts in public transport authorities respectively, which helped me to obtain a lot of valuable information.

6.2 Conclusion

To sum up, this study reported how service design methods could be employed to evaluate foreign passengers' public transport experience in the case of the Greater Helsinki region. The study concentrated on the perception of reliability, which is one of the critical contents of the public transport experience. The outcomes of this research are a user-centric study that basis on service design methods can be utilized in further studies that deal with the foreign passengers 'public transport experience in the city.

It is proved that applying the service design method is suitable for improving foreign passengers' public transport experience. User-centric service design methods help to understand the travel behaviours of diverse foreign passengers. The service design methods also provide broader viewpoint to the public service. Moreover, the visualization tools of service design can provide a common language for internal and external communications among public transport experience design works.

The factor of communication between public transport organizations and foreigners has been highlighted to improve the perception of reliability. The results suggest that public transport authorities should communicate with passengers to form a reasonable expectation that public transport service can match for improving the sense of reliability for foreign passengers. This study proposes two communication directions: early communication improvement and collaboration with other organizations.

6.2.1 Benefits

To apply service design method into public transport experience improvement, the needs of differentiated users, foreign passengers, are identified and met. Service design methods also help to develop passenger experience at all touchpoints on the user journey from cognition to use. This study evaluates their public transport experience from a very early stage when they plan their journey in their own country. Throughout the interaction between foreign passengers and all touchpoints of the public transport system, it is found that public transport service level is not the most important for foreign travellers when many public transport organizers improve the public transport service quality through optimizing system scheduling. Foreign passengers would not be attracted by excellence the public transport system if they do not know about it (Le, 2014). The outcome suggests that foreign passengers should be better educated for using public transport in Greater Helsinki region through early cross-channel marketing strategy before they come to Finland, so as to improve their public transport experience. User-centric mindset brings more empathic understanding about travel behaviours and needs of foreign passengers for local designers of the local systems. Differentiated traffic needs of foreign passengers have been met, which can enhance the attractiveness of cities to them (Virkar & Mallya, 2018). This will contribute to the promotion of the tourism economy. Even though the thesis focuses on foreign passengers, it could promote to investigate other differentiated passenger needs in further studies.

6.2.2 Limitations

It might be argued that there are few foreign tourists taking part in the research. As the research time and funding were limited, I was not able to reward foreign tourists as the research participants, so I chose foreigners who live in the Greater Helsinki region for a period of time as the research participants. Fortunately, I met a vital time node, during which HSL has made a significant change to public transport services. HSL has adopted a new ticketing system and changed the zone divisions.

For many foreigners, it is equivalent to using new public transport services. I studied the changes in their public transport experience around this period. This group of people also have some characteristics of local residents, let me take a comprehensive view of public transport services. However, it is undeniable that in order to ensure the reliability of this research, the results should be verified with a bigger number of natives and foreign tourists.

6.2.3 Recommendations for Future Study

In future studies, user-centric service design methods can be applied to understand more differentiated needs of passengers, as personalization is the trend of future public transport services. In this study, a wide range of studies have been carried out on foreigners' public transport experience. Hence, the first suggestion for further research is to differentiate the foreigner group. For example, it is evident that in Greater Helsinki region, tourists from Asia have to overcome more obstacles than tourists from Europe. Therefore, further studies can focus on Asian tourists to understand their travel motivation and needs in the Greater Helsinki region. It is also found the public transport experience of foreigners living in Helsinki can be improved. The residents discussed user information management a lot during the research.

6.2.4 Self-reflection

I am grateful for the opportunity to study the public transport system in Finland from the perspective of user experience design. I have gained new knowledge of this large urban system. During the research, I realized the value of applying the user-centric design method to public transport services improvement. The 'game rules' of urban traffic are changing, and the future public transport services are heading to personalization and diversification. It is necessary to understand the differentiated needs of passengers.

Through the academic literature of user experience design and service design, I realized that the user-centric design approaches I used in previous design projects were just the tip of the iceberg. The selection and design of user research methods will influence the final design outcome. This stimulated my thirst for knowledge about design methods.

As a designer, I am used to getting inspiration from diverse ideas in the group. But this research project is a personal project, so I consulted a lot of people in the process of research. At first, I wanted to get rid of this habit, but I realized that different voices were useful for my design research. The transportation system I studied is an interdisciplinary and complex system, and it is geared to a wide variety of passengers. One-sided knowledge cannot help create an excellent public transport service.

In addition, through this research, I have gained a lot of project management knowledge, concerning to develop feasible project plans, time management, communication with different people, and handling emergencies. Although the process is not smooth, I am satisfied with my work and the outcome of the project. I will take this Master thesis project as a benchmark for the other Master degree thesis which is about public transport service in Shanghai.

This is a meaningful start.

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Appendix

In-depth interview Plan

Participant / Foreign passengers from different countries and regions

Time/ 30-45 minutes

Format/ Semi-structured Interview and self-documenting (UX Curve and Content Map)

□ Consent form -recording

□ Demographic Info

□ Tuning-in session

- **What is a reliable public transport experience in general?**
- **The past moment when you think public transportation is very reliable**
- **The past moment when you think public transportation is not reliable**
- **Do you feel reliable when you use HSL service in the first month in Finnish Capital Region?**

□ Content map

Write down positive and negative factor that influence your sense of reliability when you are using public transport.

□ UX curve

Draw a curve to depicting you sense of reliability when you use public transport since HSL change their service. Describe why the curve change below.

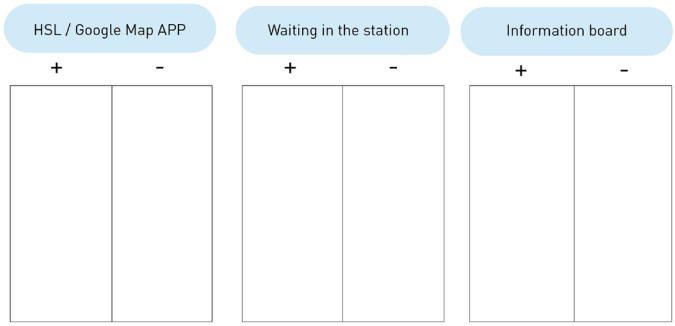
□ Situated interview

Ask questions according to the self-documents.

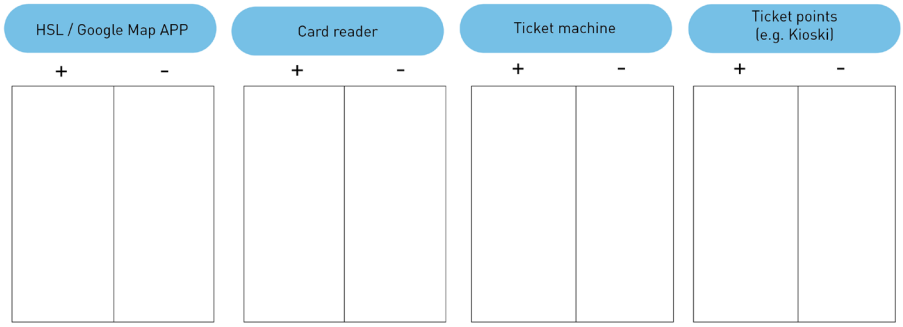
Content Map (Ahola, 2017)

Reliability: The public transport is reliable

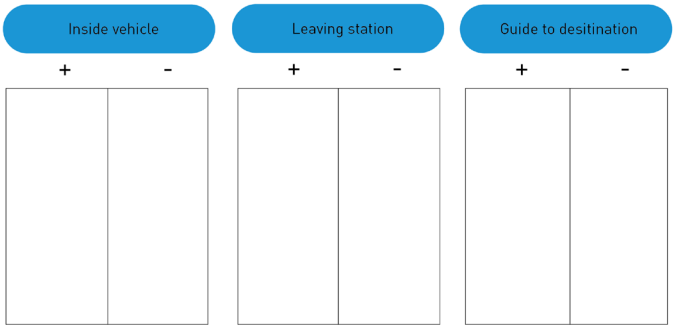
Plan



Buy tickets/ Charge card



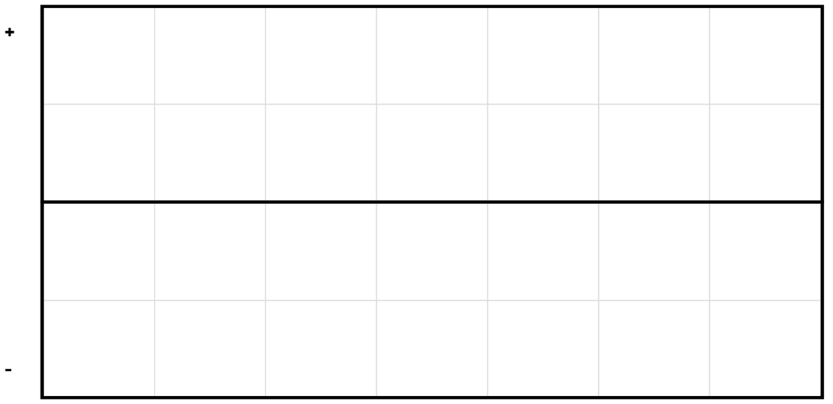
Travel



Name: **Age:** **Gender:** **Additional Info:**

UX Curve (Kajula et al., 2011)

Reliability: The public transport is reliable



HSL change service

Short description of change